



THE ROLE OF INNOVATION HUBS IN BUILDING COMMUNITY RESILIENCE

A Thesis submitted by

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ABSTRACT

Innovation ecosystems are presumed to be beneficial for local communities. Actors in roles of financial capital, government, incubators, education, research, and entrepreneurs collaborate to realise economic and social outcomes. These outcomes are expected to influence community resilience, defined in this research as economic, built environment/infrastructure, social and individual, and institutional resources that allow a community to thrive in conditions of uncertainty. Driven in part by these expectations, there has been significant growth in the Queensland innovation ecosystem. This growth includes the establishment and management of innovation hubs.

Yet there remains limited empirical evidence within literature demonstrating the link between innovation ecosystems and community resilience outcomes (Bristow & Healy, 2018; Simmie, 2014). There is also ambiguity in the constructs of the innovation ecosystem, innovation hubs, and community resilience. The emerging and socially constructed nature of the innovation ecosystem makes applying existing models to address this ambiguity through research difficult, as the models may not reflect the reality of those in a local community.

This research took a systems theory approach using actor network theory and critical realism to understand the role of the innovation hub in the innovation ecosystem, the contribution of the innovation ecosystem on community resilience, and the contribution of the innovation hub on community resilience. This was achieved through a literature review, assessment of the Australian context, and 147 interviews with roles across 16 regions in Queensland, Australia. Interviews were performed using an appreciative inquiry approach. Data was coded based on actors and roles, the sentiment as a benefit or barrier for the contributing and receiving role, and the expected impacted community resilience indicator. Results were analysed using social network analysis.

This research suggests that the innovation ecosystem and the innovation hub have an enabling and inhibiting contribution towards community resilience. The innovation hub performs functions that are core to its services for innovation and entrepreneur outcomes, internal to operational capability and capacity, external influence to work with the local ecosystem, and external concern where it may not be involved but impacts outcomes. The interaction of the innovation hub with other roles is reviewed to consider strategies to influence the impact on community resilience.

This research advances the body of knowledge through the relationships between the three constructs of the innovation ecosystem, the innovation hub, and community resilience, as well as the application of systems theory, actor network theory and critical realism for innovation ecosystems. Policy can benefit from guidance on planning and development related to multiple innovation ecosystem roles. Finally, practitioners can use the results to develop strategies and build sustainability into their business models.

CERTIFICATION OF THESIS

I declare that the work presented in the thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university.

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LIST OF KEY DEFINITIONS

Definitions of many of the terms below are varied, contributing to the ambiguity and justifications of this research. Working definitions of key concepts are outlined below in order to provide an initial consistent interpretation of these key terms throughout this thesis.

Accelerator programs A short-term (1 to 6 months) structured programs to support the rapid growth of an entrepreneur firm. The program has a start and end date and has potential for funding.

Actor An actor is a specific organisation or individual that fills one or more roles and performs functions in the system.

Chamber of commerce Provide advocacy for local business, events and networking, and dedicated mentoring programs. The focus varies significantly by region and various models exist. Some are funded by local government, others rely solely on member fees to maintain independence for advocacy. Chambers have the potential to provide access to networks and customers for early validation and have a vested interest in supporting local businesses of all forms.

Community Community is defined as “the local unity of a group of human beings who live their social economic, and cultural lives together and jointly recognize and accept certain obligations and hold certain standards of value in common” (Porter & Cantarero, 2014, p. 1094; Murgaš & Klobučník, 2017).

Community resilience Community resilience is “the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise” (Hightree et al. 2018).

Coworking space A coworking space is a physical location that offers short-term and flexible desk space for hire.

Ecosystem – innovation, entrepreneur, startup, knowledge, technology
The ecosystem describes the inherent complexity and motion within a system, as defined by the original author as a “constant interchange

of the most various kinds within each system.” (Tansley, 1935, p. 299; Willis, 1997). The focus and boundaries of the ecosystem are defined by the preceding word: *innovation* ecosystem, *entrepreneur* ecosystem, *startup* ecosystem. For example, innovation ecosystem is described as “the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation” (Oh et al. 2016). The functional goal of the entrepreneur ecosystem is to support entrepreneur’s and the goal of a startup ecosystem is to enable startup companies. Unless explicitly stated, the term ecosystem is used in this thesis as a general reference to innovation ecosystems.

Entrepreneur An entrepreneur is “a person who begins a business, taking upon themselves a financial risk with the hope of a profit.” (Oxford, 2019; Innovation and Science Australia, 2016). Key characteristics in this definition include personal initiation, ownership, control, risk, and potential for personal gain (Gartner & Shane, 1995).

Function A function is a grouping of activities to achieve outcomes in the system.

Hackerspace/Makerspace/Artspace

A hackerspace, makerspace, or artspace is a physical space designed for working with hardware and creative media.

Hackathon A hackathon is a series of short and intensive activities focused on solving a problem or building a business or business ideas. The event is usually held over one to three days but can continue over several weeks.

High growth firm The parameters of what constitutes a high growth firm can vary, but in general includes: “All enterprises with average annualized growth greater than twenty per cent per annum, over a three-year period. Growth is thus measured by the number of employees or by turnover.” (Eurostat / OECD, 2007, p. 61).

Innovation

While innovation definitions vary, innovation can be seen broadly as involving transformative steps to create new or improved products or services that add or create value (Baregheh, Rowley & Sambrook, 2009). The more detailed definition by the OECD is as follows: “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.” (OECD, 2018, p. 20)

Innovation hub

An innovation hub is a form of business incubation and a type of organisational sponsorship. An innovation hub is physical or virtual space with dedicated resources (programs, mentors, capital) to support entrepreneurs. Innovation hubs go beyond the traditional coworking model through dedicated resources to provide access to connections and networks, a space and community of like-minded individuals, and skills development all related to entrepreneurial activity (Gathege & Moraa, 2013). This definition can be expanded to include hubs not simply as physical spaces, but “‘human spaces’ which facilitate collaboration between individuals and organisations” (Kovács & Zoltán, 2017). The emphasis on the human element allows for an expanded inclusion of virtual or online hubs, “pop-up” locations such as a pub or library activated by a local group or program, and individual leaders who bring people together in a community to support individual projects and businesses entrepreneurship and innovation (Schopfel, Roche & Hubert, 2015; Cabras, & Mount, 2016).

Innovation system / National innovation system

The innovation system is the system (roles, actors, network, functions) that facilitates the innovation process. This occurs within various geographic, technical, and social boundaries (OECD, 2018). The boundary of the system includes “all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations” (Edquist, 1997).

The technical definition applied to the national innovation system level is “The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.” (Freeman, 1987; OECD, 1997, p. 10).

Region / Regional

“A region is typically defined as an area that contains a cohesive network of trade and commerce; local commuting for jobs and shopping; common access to services; and association of community activities” (NSW Government, 2017, p. 11). The concept of region for this research borrows on the definition of functional economic regions (FER). The Australian Productivity report considering that identity and function play a role in defining regions, in that:

people often travel between areas for work or to access services;

businesses hire workers, purchase services, and sell products and services across areas; and

governments and people interact economically, socially and culturally across areas.

FERs benefit as they “facilitate better evaluation and implementation of regional strategic plans and development policies.” (Productivity Commission, 2017, p. 5). The term “regional” is used to consider areas outside of what would be considered a capital city’s functional area.

Role

A role is a set of norms, behaviours, and attitudes organised around one or more functions (Biddle, 1986).

Startup

As outlined by Australian advocacy body StartupAus, “There is no current centralised definition of a ‘startup’ in Australia. Competing definitions exist across existing programs, requiring startups to requalify for each scheme. As startup-focused programs proliferate, this regulatory burden is likely to increase.” (StartupAus, 2018, p. 17). The lack of clear definition is experienced in the general business community, with many considering any company starting out to be a

“startup”. The definition utilised in by StartupAus is used for this research: “A young high-growth company that is using technology and innovation to tackle a large, probably global, market, with two defining characters: Potential for high growth and disruptive innovation.” (StartupAus, 2019).

System

The system is defined by actors and the network created by the actor’s interactions as they perform functions within defined boundaries (Williams & Imam, 2006). A system “consists of elements discernible within the total reality (universe), defined by the aims of the investigator. All these elements have at least one relationship with another element within the system and may have relationships with other elements within total reality.” (Deckers, 2017, p. 16). Through the research, terms of actors, roles, and functions are intentional as described below:

Third space

A space for engagement of community distinct from work or home.

ABBREVIATIONS

ANT	Actor Network Theory
ARIP	Advancing Regional Innovation Program
BEC	Business Enterprise Centre
CR	Critical Realism
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EDO	Economic Development Organisation
TAFE	Technical and Further Education
NGO	Non-government Organisation

CHAPTER 1: CONNECTING INNOVATION ECOSYSTEMS AND RESILIENCE IN REGIONAL COMMUNITIES

1.1 Introduction

Chapter 1 provides an overview of the research, beginning with a rationale for the research relating to the growth of investment and activity in the Australian innovation ecosystem, understanding emerging roles such as the innovation hub, and the impact of the innovation ecosystem and the innovation hub on community resilience. The Chapter then describes the basis for the philosophical approach of systems theory, critical realism, and actor network theory for the research. Section 1.4 outlines research objectives and questions relating to the role of the innovation hub in the innovation ecosystem and the contribution of the innovation ecosystem and innovation hubs towards community resilience. Section 1.5 describes the methodology, focusing on critical realism as the research method and the epistemological position, and the application of appreciative inquiry for the qualitative interviews of actors in the Queensland innovation ecosystem. Finally, the Chapter highlights the theoretic, methodological, and practical gaps and contributions of this research before summarising the thesis and concluding.

1.2 Rationale for this research

Economic and community development strategies suggest that innovation ecosystems build resilience in regional communities through economic diversification (Williams, Voreley & Ketikidis, 2013), business adaptability (Murmman, 2013), and individual self-efficacy (Kasouf, Morrish & Miles, 2013). Supporters of such strategies argue that these benefits are particularly applicable to regional areas but are difficult to operationalise due to low population density, a lack of redundancy of services, limited and therefore expensive specialised knowledge, and low awareness (Ratten, Alvarez-Garcia & Rio-Rama, 2020). The argument that regional communities benefit from innovation ecosystems has been implicitly assumed in practice and appears conceptually logical. Moreover, extensive private and public sector investment in innovation-related activity, including the creation of innovation hubs, supports the basic premise (Hackett & Dills, 2004). Yet there remains limited empirical evidence within the literature demonstrating the link between innovation ecosystems and community resilience outcomes (Bristow & Healy, 2018; Simmie, 2014).

An extensive body of literature highlights the promise of innovation ecosystems for maximising growth and mitigating risk. Opportunities for growth include realising outcomes of technology transfer, creation of sustainable companies, and the broader development of the region, such as growth in local firms, increased employment, the attraction of people, investment, and capital, and knowledge in the form of talent and intellectual property (Graham, 2013). Innovation hubs as a type of incubator facilitate these outcomes by providing support for entrepreneurs (Amezcuca, 2013). Entrepreneurs generate renewal and system change through “creative destruction” (Schumpeter, 1912) and have the potential to deliver a net increase in new forms of business, jobs, income, and economic wealth (Fritsch, & Wyrwich, 2019). Innovation and entrepreneurship also generate social and community benefit by being “a force for peace, equality and expanded human welfare” (Acs, Szerb & Autio, 2016, p. x).

Regions face mega-trends, including rapid advances in technology and connectivity, demographic shifts, changing consumer expectations, and globalisation of markets impact global and local markets (Hajkowicz et al. 2012). Innovation ecosystems provide mitigation benefits to impacts from trends to prevent loss of jobs, industries, and social and financial capital due to technological change and competitive investment from other regions. Research indicates that up to 50 per cent of jobs will be replaced or significantly impacted by technology within the next two decades in developed countries (Stevens, 2016). Over five million jobs in Australia are expected to be impacted, with over 60 per cent of jobs in some regions being affected (Taylor, 2015).

In addition to mitigating long-term disruption, innovation ecosystems play a role in mitigating impacts from risks that are also more immediate, unexpected, and dramatic. For example, research into past natural disasters such as fires and floods find that entrepreneurship is positively related to employment and population growth in affected areas (Jung, 2015) and support recovery efforts (Grube & Storr, 2018). The recent COVID-19 global pandemic is another example of an immediate impact, with over 975,000 jobs lost in Australia in a period of five weeks (Cranston, 2020). Here again, innovation ecosystems hold promise to support local communities. Research into the HIV/AIDS pandemic in South Africa indicated that a socially-focused innovation ecosystem has a distinct role alongside government, university, and industry to provide a Quadruple Helix of regional support (Kahn, 2016).

The innovation ecosystem is considered as addressing these challenges through a contribution to community resilience. Three concepts of resilience have developed through literature as it

relates to regions or communities. One conceptualisation of resilience is that of a return to an original state, a second is the transition of a community from one state of equilibrium to another state, and a third concept is that of an inherent state of readiness for continuous adaptation (Martin, 2012; Wink, 2012). This latter state of adaptation is seen in situations where disruptions are both systemic and embedded as well as immediate and uncertain. Approaching resilience as a capacity for adaptation strikes a balance between control and chaos and allows for complexity, disequilibrium, and continuous and non-linear change within parameters of capability and intention (Bec et al. 2018; McCrea et al. 2014).

And yet assessing the impact of an innovation ecosystem on a region's community resilience is a challenge due to inconsistent approaches to measurement, a lack of shared understanding of variables measured, and challenges with isolating the cause-and-effect of innovation activity to outcomes (Bruns, et al. 2017). Successful outcomes from an innovation ecosystem arise from unexpected activities, are often documented in a different physical location, attributed to an unrelated contributing event or program, and the contribution of qualitative factors of culture and capability building can be difficult to isolate (Köster et al. 2012). Previous research that connects innovation ecosystem-related activity and community resilience focused on entrepreneurs and place-based resilience in relation to natural disasters, economic shocks, and marginalisation (McNaughton & Gray, 2017; Simmie, 2014); the resilience of entrepreneurship based on regional culture and history (Fritsch & Wyrwich, 2019), the resilience of the innovation ecosystem itself (Pinto & Nogueira, 2018); the connection between entrepreneurial activity and community resilience, with a focus on non-metro regions (Steiner & Atterton, 2015); and the role of the innovation hub in contributing to local economic growth (Jiménez & Zheng, 2018). There remains a gap in a broad understanding of the role that the innovation ecosystem plays across multiple factors of community resilience.

This gap between demonstrated innovation activity and resilience outcomes does not preclude the investment into innovation activity by institutions such as governments responsible for regional growth and sustainability. In 2015, the Australian government released the \$1.1 billion, four-year National Innovation & Science Agenda program designed to “*drive smart ideas that create business growth, local jobs and global success.*” (Commonwealth of Australia, 2015b, p. 1) and “ignite a national ‘can-do’ attitude” (Pyne, 2015). State and territory governments followed suit with innovation programs including: Queensland’s \$650 million investment into the Advance Queensland innovation program (Queensland Government, 2018), Victoria’s two-year \$150 million Victorian Jobs and Investment fund allocating \$10

million to the startup-focused LaunchVic program (Victoria State Government, 2019), Western Australia's \$16.7 million New Industries Fund (Government of Western Australia, 2018), the Northern Territory's \$89 million local jobs fund (Northern Territory Government, 2019), Tasmania's \$1.1 million investment into innovation hubs (Tasmania Government, 2019), New South Wales support for multiple precincts including a projected \$4.3 million into a new Sydney Innovation and Technology Precinct (New South Wales Government, 2019; NSW Parliament, 2019) and South Australia's \$551 million investment into the Adelaide City Deal which includes the new Lot Fourteen innovation hub (Government of South Australia, 2019). Even local governments invested in innovation, such as Ipswich City Council's 2016 investment in establishing and managing the Fire Station 101 innovation hub to "ignite innovation — helping them grow the economy, create jobs and make our city even more liveable" (Fire Station 101, 2019).

Fuelled by public sentiment and government support, the distribution of innovation services increased rapidly across both regional and greater city areas. As outlined in Chapter 4, the number of innovation hubs increased significantly between 2015 to 2020. Innovation hubs are particularly relevant to local communities due to physical presence of the hub as a shared space (Cabras & Mount, 2016), the sourcing of local investment for innovation hub activities and member support (Mariotti, Pacchi & Di Vita, 2017), creation of local community outcomes (Wang & Loo, 2017; Jiménez & Zheng, 2018), and local leadership in the hub (Fuzi, 2015). The place-based emphasis is more pronounced in non-metro areas. Factors of distance and density increase the challenge of providing innovation services.

As a form of a third space, coworking provides a sense of community through endorsing, encountering, and engaging (Garrett et al. 2017), a point for finding people, ideas and other resources (Waters-Lynch & Potts, 2016), a place to develop strategies for precarious work (Peuter et al. 2017), opportunities to contribute towards economic development (Holm, 2017), and provision of a new form of urban social infrastructure (Merkel, 2015). While innovation hubs can expand beyond geographic boundaries, such as the case when hubs are virtual for geographically dispersed regions or when hubs focus on sectors such as agriculture that span multiple regions, the innovation hub remains a focus in the domain of place-based innovation (Solly, 2016).

As argued above, innovation ecosystems provide significant opportunities for economic and social development in regional areas. Still, there is a critical need to understand better the

contribution of the innovation ecosystem on community resilience. An understanding of this contribution is necessary given the rapid and significant growth of investment into innovation ecosystem activity, particularly by governments. The innovation hub is an emerging concept in innovation ecosystems, is central to much of the recent activity, and provides a lens by which to assess this impact. Hence, this research aims to better understand the role of the innovation hub and the innovation ecosystem overall in contributing to community resilience, with an emphasis on regional communities. The research questions that guide this study are detailed in sections 1.4 and 3.1.

1.3 Philosophical approach

This research is grounded in systems theory and systems thinking as an ontological position (i.e. what is real, the nature of reality) in consideration of three primary constructs of the innovation ecosystem, community resilience, and the innovation hub. A critical realist view is applied as an epistemological position (i.e. our knowledge about reality) between positivist functionalism and deconstructive postmodernism. This position suits the socially constructed and dynamic nature of the innovation ecosystem and allows for the integration of prior data and frameworks on research results while mitigating bias from predefined models. Actor Network Theory is used to both describe the nature of the system as well as the as an initial lens on the innovation ecosystem. The constructs and context examined include the influence of the innovation ecosystem on community resilience and a specific focus on the innovation hub as one role in the innovation ecosystem (Figure 1-2).

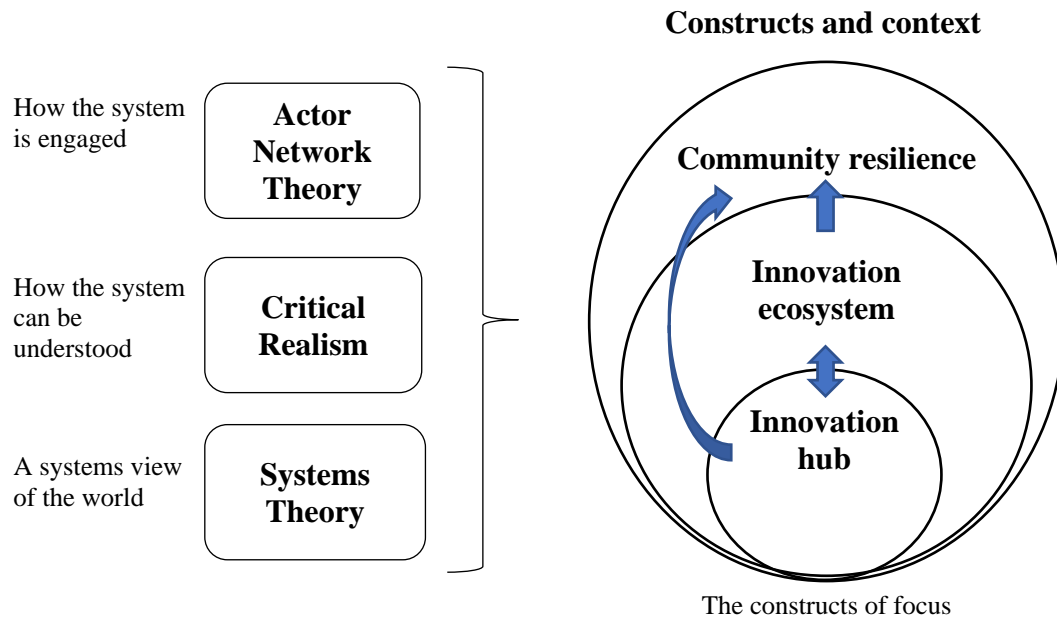


Figure 1-1 Philosophical approach using Systems Theory, Critical Realism, and Actor Network Theory

At its most basic level, a system is “a collection of parts that, through their interactions, function as a whole” (Foster-Fishman et al., 2007, p. 198). Systems thinking is a more formal and abstract process focused on the construct of the system itself (Cabrera et al., 2008). The application of systems theory to this research focuses on the systems science perspective as an underlying doctrine that suggests a system exists and actors in the system exhibit behaviour (Pickel, 2011). Systems theory is incomplete as a worldview to explain the nature of social systems. Still, it does provide a solid and holistic structure and scaffolding upon which other theories can be built (Pickel, 2011). Hence, the framework provides a starting point to build a systems philosophy perspective using critical realism and actor network theory to explain how the dynamics and interactions of actors within the innovation ecosystem and actors and the innovation ecosystem on an outcome such as community resilience. Systems theory provides a generalisable approach, while also being able to take into account interdependence, openness and boundaries, and the dynamic of equilibrium-seeking versus structural growth and changes from internal and external stressors (Hill, 1971).

The research adopts a critical realist perspective as a compromise between a functionalist view with pre-defined models and a postmodern perspective that rejects established narratives. The use of established models can present challenges when applied to inherently complex applications such as innovation ecosystems. These challenges include introduction of inherent biases from preconceptions about the actors; failure to recognise the role that knowledge and

meaning play among human actors; introduction of inefficiencies from having to first educate people on the model; limit engagement of those who feel not included in the model; failure to reconcile the richness, complexity, and variety in social worlds; limit when the reality of a specific context does not fit the model (Blundel, 2006); build artificial barriers between stakeholders by emphasizing differences over common concerns (Callaghan & Colton, 2006, p. 933; Ramsay, 1996); and limit the scope and structure based on boundaries that are inherently socially defined (Gunderson and Holling, 2002; Pendall, et al. 2008). A failure to acknowledge models, however, can result in a lack of practical outcomes from an “all-embracing, all explaining” postmodern discourse” (Blundel, 2006, p. 33). Using approaches aligned with a more postmodern perspective could risk the research having a lack of rigorous commitment to theoretical contribution, limited detail in sampling and data analysis descriptions, a lack of appropriate theoretic sampling (Makela & Turcan, 2006), and a lack of practical outcomes (Blundel, 2006, p. 33).

Critical realism (CR) bridges the gap between positivism and postmodernism, aligning with a progress-orientated mandate as compared to deconstruction towards uncertain outcomes (Parker, 1995). Data is collected within a structured and iterative process of explication, retrodution and empirical corroboration to explore the causal explanations for events (Hu, 2018). The research is structured around CR’s interrelated domains of reality: the empirical (human actors’ observations, perceptions, and sensations of reality – captured through interviews); the actual (social events resulting from mechanisms and causal powers embedded in a structure of entities – captured through observations); and the real (the structure of entities including causal powers and generative mechanisms both realised and unrealised or hidden – captured through the literature review) (Hu, 2018; Fletcher, 2017).

To further supplement CR within the framework of systems theory, Actor Network Theory (ANT) is used to accommodate the emerging, complex, and continually changing nature of innovation ecosystems. The inclusion of ANT is to trace connections through structures which are frequently made and remade, allowing for an emphasis on human and non-human actors (Elder-Vass, 2008). ANT is used in this research to allow the relationships between actors to emerge within a loosely defined framework, precluding a purist grounded theory approach and avoiding prescribing the nature of the relationship between actors from a positivist approach. ANT does not in itself make substantive claims but is more general principles needed to carry out an observation (Sayes, 2014). The model allows observation beyond a single theory from as many viewpoints as possible and listens to other actors more than the viewer’s presumptions

(Venturini, 2010). The use of ANT allows the research to accept how ‘messy’ reality is prior to accepting ‘cold, hard facts’ of a definition (Vicsek et al. 2016). Theoretical and practical gaps relating to the three primary constructs – innovation ecosystem, innovation hub and community resilience – are briefly described in Section 1.4 and expanded upon in Chapter 2.

1.4 Research objectives and research questions

The objective of this research is to explain the innovation hub’s role in the innovation ecosystem as a contributor to community resilience. To achieve this objective and considering the discussion above, this explanation includes an understanding of the innovation hub business model, a secondary examination of roles of other actors in the innovation system, and the impact of the innovation system overall in community resilience. This will be achieved through research that addresses the questions below.

First, the function of the innovation hub in the innovation ecosystem is examined. The innovation hub is defined as a physical or virtual space with an explicit purpose to create and support scalable businesses. The role of the innovation hub is assessed, including providing access to networks and connections, mentoring and business support, and a shared space for community. These functions are considered in the broader context of other actors in the innovation ecosystem, including government and policy, investment entities, service providers, established corporations, the local business community, education providers and universities. This leads to a question relating to the innovation hub within the innovation system:

RQ1: What is the role of the innovation hub in an innovation ecosystem?

Second, the connection between innovation ecosystems and community resilience is considered. Innovation ecosystems have the potential to contribute to economic development indicators that relate to new economic growth, capability, and capacity. Alignment between innovation ecosystems and community resilience indicators are less obvious.

For example, innovation ecosystem indicators of employment in new high growth potential startups do not necessarily consider unemployment in traditional market sectors or underemployment of certain age, gender, or nationality demographics. Innovation ecosystems can consider access to new forms of capital and service providers available to help rapidly establish new businesses but may not consider access to social services or business service access by marginalised community segments. Thus, the second question relates to the influence of the innovation system on community resilience:

RQ2: How do innovation ecosystems contribute towards community resilience, and what are the enabling and inhibiting contributions?

Third, the contribution of the innovation hub to community resilience is examined. The previous questions examine innovation hub characteristics, the innovation hub within the innovation system, and the innovation system’s connection to community resilience. The final question follows by examining the role of the innovation hub itself on community resilience:

RQ3. What indicators of community resilience are influenced by an innovation hub, and what are the enabling and inhibiting contributions?

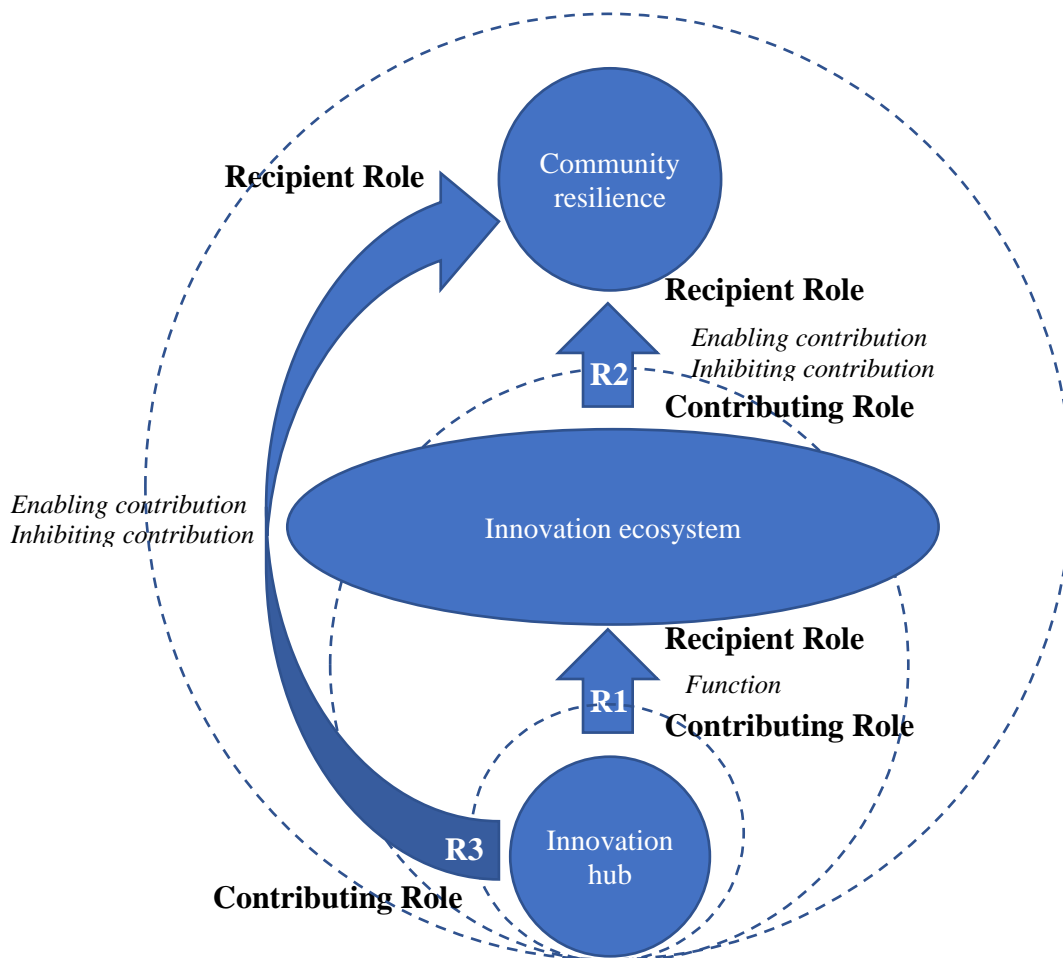


Figure 1-2 Relationship between research questions

1.5 Methodology

Section 1.3 positioned critical realism as the epistemological foundation to the methodological approach. CR applied as a methodology follows the three CR iterative stages of explication, retrodution and empirical corroboration. In the explication stage, literature and existing artifacts were reviewed to composite social events by mapping the Australian and Queensland

innovation ecosystem, developing indicators of community resilience, and mapping models of incubators and innovation hubs. Existing constructs were considered to develop a starting matrix of actors and issues or features. These created initial actor “containers” to be populated as the research progressed.

In the retrodution stage, a hypothesis was developed about the causal powers, mechanisms, and structures by mapping expected contributions of the innovation ecosystem and innovation hub on community resilience indicators. This process identified whether the innovation ecosystem overall and the individual role of the innovation hub would be expected to have an enabling or inhibiting effect on the indicator of community resilience. The result of this conceptual process is presented in Chapter 2.

In the empirical corroboration stage, the hypothetical structures and mechanisms were examined and tested through interviews, coding, and analysis to apply empirical scrutiny and compared to existing competing explanations (literature, other interview data) to achieve empirical adequacy. The corroboration process included identifying interview candidates, conducting interviews using an appreciative inquiry framework, coding the data, and analysing against expected contribution and other interview data.

Interviewees were identified through key experts and subsequent snowball sampling and approached using through the ANT perspective of allowing each actor to define their role through their narrative (Andres, 2017; Vicsek et al. 2016). Questions were structured using appreciative inquiry for a positive framework, to build capacity, and for consistency of responses (Cooperrider et al. 2008; Whitney & Trosten-Bloom, 2010). Data collection was an iterative process, continuously assessing results against previous stages and literature and other interview data (Easton, 2010).

Data were compared with other interviews and existing literature throughout the coding process, and outcomes were represented using social network analysis to represent the results against the research questions. This information informed the roles of the innovation ecosystem and the innovation hub thereby addressing RQ1 (presented in Chapter 5), as well as the contribution of the innovation ecosystem and innovation hub on community resilience to address RQ2 and RQ3 (presented in Chapter 5). This methodology is overviewed in Figure 1-3.

Theoretic framework

Systems theory	<p>The world is known as system attributes of:</p> <ul style="list-style-type: none"> • Interdependence • Openness and boundaries • The dynamic of equilibrium-seeking versus structural growth and changes from internal and external stressors
Critical realism	<p>The world is understood through:</p> <ul style="list-style-type: none"> • the empirical (human actors' observations, perceptions, and sensations of reality); • the actual (social events resulting from mechanisms and causal powers embedded in a structure of entities); and • the real (the structure of entities including causal powers and generative mechanisms both realised and unrealised or hidden)
Actor Network Theory	<p>The world is experienced as:</p> <ul style="list-style-type: none"> • Humans and non-humans as equal actors, whose value is defined reflexively by each actor in the group; <p>The notion of group is fluid, being continuously made and remade with permeable boundaries, defined by the value of work achieved by the group.</p>

Method

Critical realism Data is collected within a structured and iterative process of explication, retrodution and empirical corroboration to explore the causal explanations for events

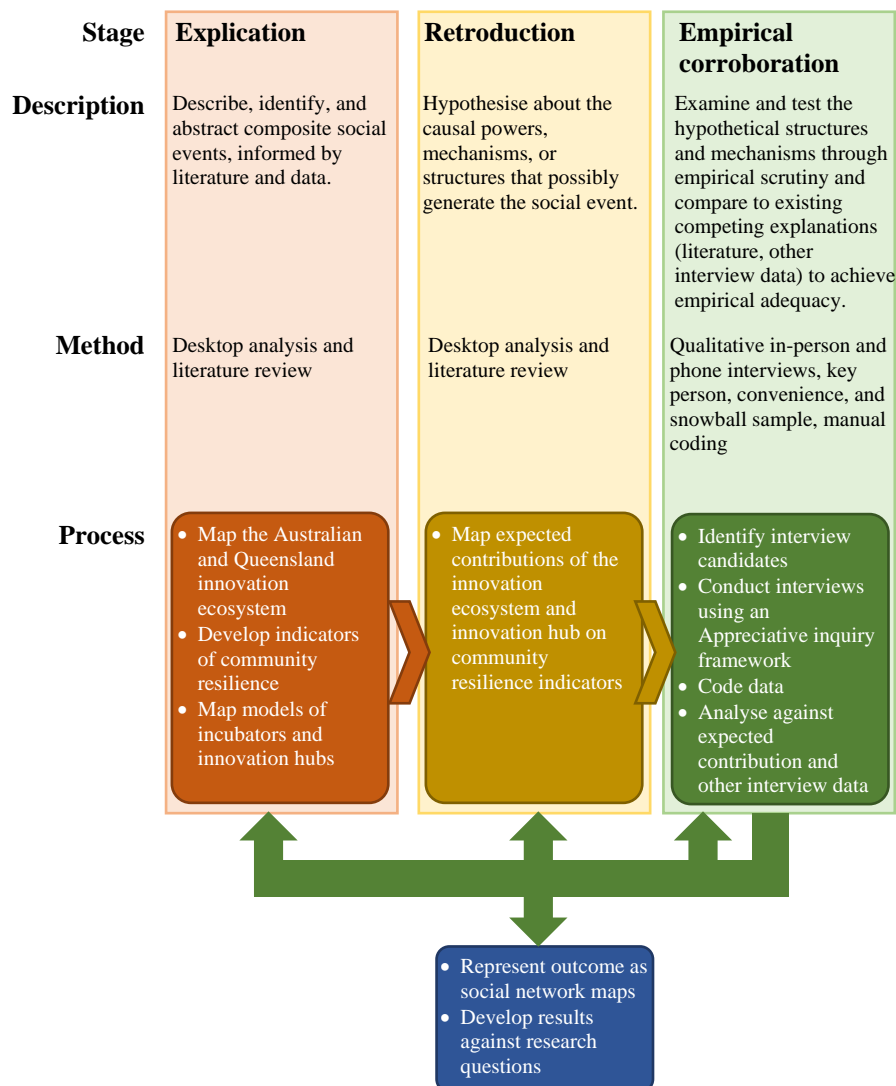


Figure 1-3 Theoretic framework and method

1.6 Contributions of this research

This research contributes towards expanding literature on the impact of innovation hubs on local community outcomes, with an emphasis on community resilience. The research is timely, capitalising on the recent increase in awareness and investment into innovation hubs. Within a narrow focus on the innovation hub as a specific actor, the research applies a broad perspective on the contributing factors of the impact of the innovation ecosystem.

The theoretical gap focuses on systems theory approaches to the integration of innovation ecosystem and community resilience research. A growing body of literature relates to both innovation and entrepreneur ecosystems (Meshram & Rawani, 2019; Roundy et al. 2018; Edquist, 1997; Cooke, 2008; Malecki, 2017; Oh et al. 2016; Gomes, et al. 2016; Stam, 2015) and community resilience (Bristow & Healy, 2018; Simmie, 2014). As both are emerging fields of research, they have suffered from ambiguity, definitional issues, and the changing nature of the context examined. Emerging literature connects innovation ecosystems and community resilience through topics including social innovation (Phillips, Lee, Ghobadian, O'Regan & James, 2014), the impact of technology innovation and economic inequality (Fazio, Guzman, Murray & Stern, 2016), socio-cultural barriers to developing regional entrepreneurial ecosystems (Walsh & Winsor, 2018), and the value of innovation ecosystems to regional or developing communities (Cavaye, 2015). However, a gap remains in literature relating to a broad systems analysis of inhibitors and enablers of the innovation ecosystem to deliver greater community resilience, as well as how individual roles contribute, such as the role of the innovation hub.

Methodologically, this thesis contributes by applying qualitative appreciative inquiry using actor network theory and critical realism to an innovation ecosystem context. There are many positivist models that pre-define and prescribe innovation ecosystem roles and functions (OECD/Eurostat, 2018; EC et al., 2013; Aspen Network of Entrepreneur Development, 2013; Szerb et al. 2013; Isenberg, 2011; Global Entrepreneurship Research Association, 2018). These pre-defined models risk missing emerging roles and functions in a relatively recent construct of the innovation ecosystem that is applied in a context that is rapidly evolving. The application of actor network theory with critical realism has the potential to address this risk through the capture of information about the current situation while applying existing theory through critical realism to inform new ways of thinking about the role of innovation hubs in innovation ecosystems.

The research also addresses several practical gaps that can be leveraged by practitioners and policy decision-makers. These gaps include the regional impact of innovation ecosystems and regional innovation hubs, understanding the sustainability of innovation hub business models to address challenges with financial stability and sustainability for innovation hubs can be a challenge (Seo, Lysiankova, Ock & Chun, 2017), the impact of investment into innovation hubs with a focus on public funds, the need for role clarity for organisations providing economic diversification in regions, and connecting theory and practice of regional economic and social policy. Lastly, this research adds to the growing body of research on regional economic and social development.

1.7 Structure of the thesis

Chapter 1 has provided an overview of the research background and rationale of this research. The Chapter presents a summary of the philosophical approach and methodology underpinning the design of the research, as well as the theoretical, methodological, and practical contributions the study makes by addressing the research questions.

Chapter 2 provides a review of the literature by summarising the historical and theoretical context of innovation ecosystems, innovation hubs, and community resilience and identifying gaps and opportunities to be addressed by this research.

Chapter 3 outlines the methodology employed in this study, providing detail of the data collection and analysis process.

Chapter 4 presents outcomes for the retrodution stage of the research, including maps of the current Australian innovation ecosystem and mapping expected contributions of the innovation ecosystem and innovation hub on community resilience indicators.

Chapter 5, Chapter 6, and Chapter 7 present the results of the research for the three research questions RQ1, RQ2, and RQ3, respectively. The results for RQ1 presented in **Chapter 5** for RQ1 addresses the role of the innovation hub in the innovation ecosystem by describing the different roles in the ecosystem and the functions that emerged from the interviews. This is to establish justification for the definition of the roles and their relationship with each other defined by the respondent's descriptions of their interactions. **Chapter 6** presents the results for RQ2 focused on the contribution of the innovation ecosystem on community resilience. This is followed by **Chapter 7**, which presents the results for RQ3 focusing on the contribution of the innovation hub on community resilience. The chapters identify contributing enabling

and inhibiting factors of the innovation ecosystem and the innovation hub towards community resilience.

Chapter 8 discusses the results for the three research questions in turn, using social network analysis to connect the research results with existing literature and concludes with consideration on implications, limitations, and recommendations for theory, policy, and practical application.

1.8 Conclusion

Chapter 1 provides an overview of themes expanded upon in detail throughout this thesis. The Chapter first provides the rationale for an investigation into the correlation between innovation ecosystems and community resilience, with an emphasis on the individual role of the innovation hub. Innovation ecosystems are an emerging concept with potential that is promising but unproven, particularly in areas of community resilience and in regions located outside high-density capital cities.

The Chapter provides an overview of the research philosophical approach. The innovation ecosystem's emerging and dynamic nature lends itself to a structured approach that is not constrained by predefined models and frameworks. The combination of systems theory, critical realism, and ANT is positioned as a philosophical approach to achieve this outcome. Each of these theoretical frameworks are identified in literature as applicable and valuable for innovation and entrepreneurial research. This research provides a unique contribution of integrating these theories into a practical application, as described in detail in Chapter 2.

Finally, Chapter One outlines the research methodology described in detail in Chapter 3 and Chapter 4. Critical realism informs the methodological framework in which qualitative interviews are conducted across the Queensland innovation ecosystem. Appreciative inquiry is used as a strengths-based questioning approach to capture information about enablers, inhibitors, possible future and strategies between different roles. It is within this structure that the correlation between innovation ecosystem roles and the roles impact on community resilience indicators are identified.

CHAPTER 2: INNOVATION ECOSYSTEMS, COMMUNITY RESILIENCE, AND INNOVATION HUBS: EXPLICATION AND RETRODUCTION

2.1 Introduction

This thesis builds on an emerging body of literature that connects innovation ecosystem activity with community impacts. Recent studies in this context make the connection between entrepreneurs and place-based resilience in relation to natural disasters, economic shocks, and marginalisation (McNaughton & Gray, 2017; Simmie, 2014). Studies have also examined resilience of the innovation ecosystem (Pinto & Nogueira, 2018), considered the role of social entrepreneurs in community resilience in remote areas (Morrison, Ramsey & Bond, 2017), and reviewed the connection between entrepreneurial activity and community resilience with a focus on non-metro regions (Steiner & Atterton, 2015).

Chapter 2 presents a structured review of the three primary constructs of the innovation ecosystem, community resilience, and the innovation hub. To do so, Chapter 2 applies critical realism to develop an understanding of the three constructs and identify gaps (Fletcher, 2017). To date, the existing literature has tended to focus on specific attributes, such as entrepreneurial activity, rather than adopting a system-wide perspective. Section 2.2. explores the history and extent of the research relating to each of the three constructs of the innovation ecosystem, community resilience, and the innovation hub to form a basis of ‘reality’ – the inherent properties of the constructs

Section 2.3 and 2.4 explores and acknowledges apparent challenges within the literature at the intersection between innovation ecosystems and community resilience. These challenges include the relatively recent and dynamic evolution of the constructs, a lack a consistent and collectively understood definitions, difficulties defining scope due to fluid socially constructed boundaries of the ‘system’, and generalisability of results due to various environmental characteristics of contexts to which the concepts are applied. Lastly, Section 2.6 presents the theoretical framework and concludes.

2.2 Systems theory and innovation ecosystems

This section presents a historical review to identify the inherent properties of the innovation ecosystem as the ‘real’ reality using a critical realist perspective. Structured conceptualisations

of systems have been around since at least the sixth century B.C. when Heraclitus and other writers in the Ionian Enlightenment-era described interactions and dependencies of scientific and philosophical concepts (Bertalanffy, 1972; Cabrera et al., 2008). As society advanced, the impacts of political, industrial, and scientific pursuits of progress created the need for increased specialisation and interdependencies. Historians, researchers, and practitioners could no longer attribute success or failure solely to the personality or performance of an isolated actor or individual action and examined the interdependencies related to systems thinking (Mele et al., 2010; Bertalanffy, 1968).

The rise of European nation-states and subsequent Great Powers reinforced geographic and political boundaries around these various political, social, cultural, functional, and procedural sub-systems (Hardach, 2003). Fredrick List is referenced as an early inspiration for conceptualising national systems with his 1841 dissertation *The National System of Political Economy* (Edquist, 1997). His place-focused analysis included acknowledgement of innovation as a factor, highlighting concepts that would later become core principles of place-based innovation systems research such as resistance to innovation by consumers who had “sunk into the utmost apathy by reason of a long despotic rule, resisted every innovation even though it was an improvement” (Lieselotte et al, 1841).

The industrial revolution discourse helped to define system boundaries around industrial output. Alfred Marshall is credited with inspiring the concept of clusters with his notion of the Industrial District in his 1895 work *Principles of Economics* (Conz, 2017) and the integration of economic, ecological, and innovation perspectives. Marshall noted parallels in ecological and economic systems, specifically on the dynamic nature of the system where “economics, like biology, deals with a matter, of which the inner nature and constitution, as well as the outer form, are constantly changing” (Marshall, 1895).

The natural environment inspired the ‘ecosystem’ construct that would eventually be used to name the various iterations of the system. Roy Clapham is credited with coming up with the term ‘ecosystem’ in 1930, and the concept was later documented in 1935 by his colleague Arthur Tansley who described the “constant interchange of the most various kinds within each system.” (Tansley, 1935, p. 299; Willis, 1997). Tansley described one large and interconnected ecosystem, connected from the universe down to the atom.

This larger system is made up of smaller isolated ecosystems, each defined by artificial boundaries that “overlap, interlock, and interact with one another” (Tansley, 1935, p. 300). He

described ecosystem characteristics including a natural lifecycle where species organise through mutual adjustment of their parts to survive or fail; is heavily influenced by conditions of the local environment; and where local organisms play a critical role in the ecosystem's lifecycle. These characteristics aptly describe human systems and subsequent researchers applied ecological metaphors to the individual organisation (Carrol, 1988; Hannah & Freeman, 1989; Oh et al. 2017) and to the broader economic environment in which the organisations operate (Moore, 1993; Shaw & Allen, 2016).

While natural environments and human systems share many characteristics, a key area where human and natural ecosystems differ is the distinctly human attribute of agency and the unique human capacity for intelligence (Iansiti & Levien, 2004). Specifically, the awareness of an individual's place in their environment, the capacity for creative projection of an alternative future state, the cognitive ability to plan for that future state scenario, the agency to move towards that scenario in a planned and ordered way, and advanced influence of others towards collective outcomes (Suddendorf, 2013). This agency for change is unique to human systems, distinguishing changes in these systems from evolutionary changes in their natural ecological counterparts.

Human agency and intent introduce the potential for what Joseph Schumpeter described as creative destruction and industrial mutation. In his 1943 political and social commentary *Capitalism, Socialism, and Democracy*, he states that "The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates." (Schumpeter, 2003, p. 110). The work of Schumpeter and others inspired modern theories that examine the role of innovation within the system. Innovation systems, diffusion of innovation, and technology acceptance models have since been applied to focus on the application and acceptance of innovation from multiple levels, including a place-based system perspective (Gathege & Moraa, 2013), transformation of institutions over time with transformation theory and institutional theory (McLennan, et al. 2014), disruptive innovation (Christensen, 1997), and individual organisations with business life-cycle theory to identify institutions that best suit entrepreneurial needs (Fuentelsaz, Maicas & Mata, 2017).

The ecosystem is not linear, as Buckley noted when he introduced the concept of 'complex adaptive systems based on a view that "the mechanical equilibrium model and the organismic homeostasis models of society that have underlain most modern sociological theory have

outlived their usefulness” (Buckley, 1968, p. 490). The characteristics of complex adaptive systems would be expanded upon through work from the Santa Fe Institute in the early 1980s (Deckers, 2017) to provide attributes that describe how actors interact in an innovation ecosystem. A summary of these attributes is provided in Table 2-1 (Robert et al. 2018).

The discussion outlined above briefly describes the evolution of systems theory and systems thinking to innovation ecosystems focused on domains of place with socially-defined boundaries. Characteristics include the emergence of innovation and change through creative destruction, uncertainty from human agency, and a high number of cross-boundary inputs from interconnected and disparate systems. These characteristics are depicted in the concept of a complex adaptive system.

Table 2-1 Dimensions and attributes of complex adaptive systems (Robert et al. 2018)

Dimension	Attribute
I. Micro-heterogeneity	1 Heterogeneous agents with creative capacity
	2 Learning and adaptation. Routines. Capacities and behaviour heterogeneity
II. Network Architecture	3 Linkages between components
	4 Network topology (hierarchy and decomposability)
	5 Partial and local information. No global controller
	6 Network externalities
	7 Multiple equilibria
III. Interactions, disequilibrium and divergence	8 Positive feedbacks
	9 Co-evolution
	10 Far-from-equilibrium dynamics
	11 Indeterminacy and uncertainty
	12 Irreversibility. Path dependency
	13 Heterogeneity of systems. Divergence
IV. Emergent properties	14 Emergent properties

2.3 Models of place-based innovation ecosystems

Early place-based innovation can be traced to national innovation systems (NIS) research from Freeman (1987), Lundvall (1992) and Nelson (1993). These early examinations tended towards two lines of focus: a geographic regional development focus; or a technology/industry sector or strategic focus (Edquist, 2001; Acs et al. 2017). The place-based focus is influenced by systems theory of planning (McLoughlin, 1969; Chadwick, 1971) and is expressed as regional innovation systems (RIS) (Cooke, 1992), regional innovation policy, networked regions (Cooke, 2015), and economic geography theory to consider the role that neighbouring regions play in shaping opportunities for growth (Delgado et al., 2014). The industry or technology sector focus draws from Porter’s work on industry clusters (1990) and related concepts of business ecosystems (Moore, 1993). Cluster theories involving collaborative networks “offer

foundations for analysing dynamic networks involving high collaboration among disparate actors, which are intrinsic characteristics of innovation ecosystems” (Rabelo & Bernus, 2015).

The boundaries of place-based human ecosystems are defined by human observers who socially construct the boundaries “based on the interactions of interest, making the very idea of ecosystem at least partly a social construct” (Pendall, et al., 2008, p. 13). These boundaries are often defined by the word that precedes the ‘ecosystem’ term. The ‘business’ ecosystem places emphasis on the supply chain relationships of a business or industry sector (Letaifa, Gratacap & Isckia, 2013). ‘Startup’ ecosystem emphasises the support network of a particular type of business - the startup (Startup Compass, 2015). The concept of entrepreneurial ecosystems places emphasis on the individual of the entrepreneur and their physical location (Scheepers, Mealy, Clements & Lawrence, 2018; Harrington, 2017). In his analysis of business, innovation, and knowledge ecosystems, Valkokari (2015) explains how different ecosystem conceptualisations differ based on the baseline understanding, relationships and connectivity, roles and actors, and logic of action.

In their review of 90 journal articles relevant to the application of the word “ecosystem” as it pertains to business and industrial context, Tsujimoto et al. acknowledged that the ecosystem term was “without clear definition or sound theoretical backing” (2018, p. 49). They categorised the ecosystem research into four major streams: industrial ecology - borrowing heavily on sustainability and energy and/or material flow analysis; business ecosystems - focused on value capture and/or value creation on central variables or actors; platform management - where the boundaries relate to a set of assets or structures to develop products and services; and multi-actor network - describing interactions between diverse and disparate external companies. They then proposed a revised definition of the ecosystem term as it applies to the commercial context: “To provide a product/service system, a historically self-organized or managerially designed multilayer social network consists of actors that have different attributes, decision principles, and beliefs.” (p. 55). Other constructs related to place-based innovation systems include business models, coopetition, multisided markets, networks, technology systems, platforms, supply chains, and value networks (Adner, 2017).

In their comprehensive literature review of 499 studies, Gomes et al. (2016) analysed the distinctions between constructs of ecosystem, innovation ecosystem and business ecosystem. Features common to most constructs include an interconnected and interdependent network of actors; the presence of a leader as a keystone actor or platform leader; ecosystems built on a

technological, supply-chain, and/or industry platform; both competition and cooperation in the ecosystem; and a lifecycle inherent to the ecosystem. The innovation ecosystem construct is distinct in its reference to value creation in the system, as compared to the business ecosystem which relates more to value capture for the individual actor.

Oh et al. (2016) conducted a critical review of terms using a definition of innovation ecosystem as “the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation” (Jackson, 2011). They identified that the emerging concept of the innovation ecosystem is distinguished from other traditional concepts such as innovation systems or clusters based on having a greater focus on social systems, the central role of digital technologies, principles of open innovation, an emphasis on niche sectors or industries, and the role of market forces. These focus points can then be applied in varying contexts, including: large corporations; geographic regions such as national, state, metro, or regional; digital supply chains; city-based; high-tech SMEs; specific ecosystem actors of incubators or accelerators; and university-based environments.

The definition and categorisation of ecosystems highlight two distinct focal points: the value in the system itself, and the value to actors in the system. Adner (2017) describes this distinction as two perspectives: ecosystem-as-affiliation or ecosystem-as-structure. The ecosystem-as-affiliation perspective places emphasis on the breakdown of traditional industry boundaries, the rise of interdependence, and the potential for symbiotic relationships in productive ecosystems. Strategies within the affiliation model focus on the quality and quantity of actors and the network rather than overall system value creation.

By comparison to the affiliation model, the ecosystem-as-structure view begins with a value proposition and identifies the set of actors that need to interact for the proposition to come about. Strategies in a structure perspective focus on the activities, actors, positions, and links necessary to realise the overall system’s value proposition (Adner, 2017). A related concept is viewing the innovation ecosystem as a platform “available to the members of the ecosystem through a set of access points or interfaces” (Iansiti & Levien, 2004, p. 148; Ding et al. 2019). The positioning of the ecosystem as a platform infers platform a “for what” with a response towards a given technology, industry, company, or core business challenge (Gawer, 2009; Gawer & Cusumano, 2013). Discrete ecosystem boundaries can be drawn around specific value outcomes of functional domains, including the creation of human capital, technology and product diffusion, regulation, market creation, networking, and financing or investment

(Edquist, 2001). Concepts such as clusters, triple/quadruple/quintuple helix, knowledge ecosystems, living labs, and learning regions also place emphasis on the function of the ecosystem overall rather than an individual actor (Carayannis et al. 2017; Järvia et al. 2018).

2.4 Community resilience

Resilience is similar to the concept of innovation in that it is intuitively understood to be of value even if the definition is not uniformly known. Resilience is an intentional outcome of Australian government place-based innovation strategies (Adams & Hess, 2010). An example can be seen Australia's use of the term over time in the federal government's annual innovation system reviews. In relation to innovation activity, the term resilience was used in relation Australia's ability to: avoid recession during the Global Financial Crisis (Commonwealth of Australia, 2010); experiment, adapt to change, and address immediate or future challenges (Commonwealth of Australia, 2011, p. 8); handle shocks and changing business and economic conditions (Commonwealth of Australia ix, 2012); sustainable social, economic, and environmental progress (Commonwealth of Australia, 2015); and build business confidence (Commonwealth of Australia, 2016, p. 69). A lack of innovation was also noted as contributing to a lower resilience, "leaving us less resilient to future global shocks" (p. 1) and correlation between diversity and resilience as "the greater the diversity of highly innovative, productive sectors in the economy, the more resilient it is to global structural shifts. (p. 23)".

Resilience shares similarities with research into innovation ecosystems in that the conceptual development is relatively new, has a place-based focus, has its origins in general systems theory, and borrows on complexity and systems theory (Vaneckhautea et al. 2017; Bec et al. 2019). The origin of resilience as a concept comes from mathematics and physics applied to physical and mechanical structures as a beneficial and protective mechanism, as in "the key is made elastic or resilient for the purpose of preventing breakage of the mainspring" (United States Patent Office, 1879). Resilience was later applied to ecological systems (Holling, 1973; Norris et al. 2008) and subsequent literature adopted the term for "social-ecological systems" from 2000 onward (Berkes & Ross, 2013). Brand & Jax (2007) provide a taxonomy of resilience constructs, Strunz (2011) offers a philosophical review of current concepts, and Grimm & Wissel (1997) present resilience as one of 70 concepts related to ecological stability. The concept has been applied as a metaphor to systems of people and ecology to describe the current or potential ability, capability, characteristic, attribute, or process of a domain to adapt or return to a desired state (Norris et al. 2008).

Similar to the prior discussion on ecosystems, the term that precedes ‘resilience’ often defines the domains or ‘system of application’ (Cutter et al. 2008). Examples include *community* resilience (Magis, 2010; Community and Regional Resilience Institute, 2013), *community economic* resilience (Dinh & Pearson, 2015), *cultural* resilience (Fleisher, 2009), *ecological* resilience (Holling, 1973; Holling, 1996), *economic* resilience (Briguglio, et al. 2009; Duval, et al. 2007; Rose, 2009), *ecosystem* resilience (Brand & Jax, 2007), *engineering* resilience (Holling, 1996; Brand & Jax, 2007), *individual* resilience (Luthar & Cicchetti, 2000), *regional economic* resilience (Hill, Wial & Wolman, 2008), *rural community* resilience (Wilson, 2010), *seismic* resilience (Bruneau, 2003), *social* resilience (Adger, 2000), *urban* resilience (Meerow et al. 2016), and resilience in systems in general (Holling & Walker, 2003). The unit of analysis for resilience can be individual, household, community, or region (Cutter et al. 2008) and apply to social-ecological systems, and psychology of development and mental health (Ross, 2013).

The diversity and inter-relatedness of these resilience domains result in a lack of clarity for definition and application. Noriss et al. (1993) analysed 20 definitions across literature, describing resilience as a set of networked capacities and noted resilience is better conceptualised as an ability or process rather than an outcome. A sample of definitions for various domains is outlined below in Table 2-2.

Table 2-2 Resilience definitions across different domains

Construct	Definition	Source
Community Economic Resilience (CER)	the capacity of a community economy as a whole to counteract the negative economic impacts of disturbances and to adapt to changed economic conditions due to disturbances, in order to maintain non-declining economic standards of living	Dinh & Pearson, 2015
community resilience	<ul style="list-style-type: none"> •Existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise. •The capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change. 	Magis, 2010 Community and Regional Resilience Institute, 2013
Cultural resilience	The perpetuation of culture within conditions and limits of on-going environmental shifts that require continuing adaptations	Fleisher, 2009
Ecological resilience	Emphasises conditions far from any equilibrium steady state, where instabilities can flip a system into another regime of behaviour - to another stability domain. The measurement of resilience is the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behaviour.	Holling, 1996
Economic resilience	<ul style="list-style-type: none"> •the policy-induced ability of an economy to recover from or adjust to the negative impacts of adverse exogenous shocks and to benefit from positive shocks. •the ability to maintain output close to potential in the aftermath of shocks, comprises at least two dimensions: the extent to which shocks are dampened and the speed with which economies revert to normal following a shock 	Briguglio, Cordina, Farrugia, & Vella (2009) Duval, Elmeskov & Vogel (2007)
Economic resilience (dynamic)	the speed at which an entity or system recovers from a severe shock to achieve a desired state	Rose, 2009
Economic resilience (static)	the ability of an entity or system to maintain function (e.g., continue producing) when shocked	Rose, 2009
Ecosystem resilience	the amount of disturbance that a system can absorb before changing to another stable regime, which is controlled by a different set of variables and characterized by a different structure.	Brand & Jax, 2007
Engineering resilience	<ul style="list-style-type: none"> •Concentrates on stability near an equilibrium steady state where resistance to disturbance and speed of return to the equilibrium are used to measure property. •The time required for a system to return to an equilibrium point following a disturbance event 	Holling, 1996; Brand & Jax, 2007
Individual resilience	Dynamic process wherein individuals display positive adaptation despite experiences of significant adversity or trauma	Luthar & Cicchetti, 2000
Psychological resilience	The ability of individuals to recover from adversity. Emphasizes identifying and developing community strengths, and building resilience through agency and self-organization, with attention to people–place connections, values and beliefs, knowledge and learning, social networks, collaborative governance, economic diversification, infrastructure, leadership, and outlook.	Ross, 2013
Regional economic resilience	the ability of a region (defined roughly as a metropolitan area) to recover successfully from shocks to its economy that either throw it off its growth path or have the potential to throw it off its growth path but do not actually do so.	Hill, Wial & Wolman, 2008
Resilience	a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables	Holling, 1973

Construct	Definition	Source
Resilience	the potential of a particular configuration of a system to maintain its structure/function in the face of disturbance, and the ability of the system to re-organize following disturbance-driven change.	Holling & Walker, 2003
Resilience (adaptive)	the ability in crisis situations to maintain function on the basis of ingenuity or extra effort (e.g., increasing input substitution possibilities in individual business operations, recontracting or strengthening the market by providing information to match suppliers with customers)	Rose, 2009
Resilience (inherent)	the ordinary ability to deal with crises (e.g., inventories, the ability of individual firms to substitute other inputs for those curtailed by an external shock, or the ability of markets to reallocate resources in response to price signals)	Rose, 2009
Resilience (stability)	Returning to the reference state (or dynamic) after a temporary disturbance	Grimm & Wissel, 1997
Rural community resilience	the robustness, the rapidity, the redundancy (extent of substitution) and resourcefulness of a community to find ways to address internal and external challenges threatening multifunctional quality at the intersection between economic, social and environmental capital	Wilson, 2010
	The ability of rural economies and communities to resist disturbance and/or return to a pre-existing condition	Cabras & Mount, 2016
Social-ecological Systems approach	the capacity of the system to continually change and adapt and yet remain within critical thresholds. the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.	Ross, 2013
Seismic resilience	the ability of both physical and social systems to withstand earthquake-generated forces and demands and to cope with earthquake impacts through situation assessment, rapid response, and effective recovery strategies (measured in terms of reduced failure probabilities, reduced consequences, reduced time to recovery)	Bruneau, 2003
Social resilience	the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change	Adger, 2000
Urban resilience	the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.	Meerow et al. 2016

Various perspectives on resilience emerge when reviewing the definitions such as outlined in Table 3. Meerow et al. (2016) identified six categorisations for resilience in their review of 172 publications and 25 definitions: 1) how the domain is characterised; 2) how equilibrium is viewed; 3) whether resilience is a positive or neutral (negative) concept; 4) the pathway to resilience; 5) an understanding of adaptation; and, 6) the timescale of action. Most literature reviews agree that there are multiple perspectives on how resilience is applied. engineered (equilibrium-focused) resilience, ecological (panarchy-focused) resilience, and adaptive (complexity-focused) resilience (Martin, 2012; Wink, 2012).

The first perspective of engineering resilience is most characteristic of the physics or material background of stability, elasticity, and a return to equilibrium following a disturbing event

(Holling, 1996; Grimm and Wissel, 1997). Destabilising forces are viewed as important to contribute to diversity and opportunity while stabilising forces are needed to maintain productivity (Holling, 1996). Engineering resilience can be viewed as a measure of the time a system needs to recover or return to equilibrium after a disturbance, reduced down to a single stock variable of relative evaluation following a disturbance and measured after the fact (Strunz, 2012). Definition examples include: “The ability of rural economies and communities to resist disturbance and/or return to a pre-existing condition” (Cabras & Mount, 2016, p256); “The capacity of a system to absorb disturbance and reorganize while undergoing change to retain essentially still the same function, structure, identity, and feedbacks” (Wilson, 2012, p1218); and “Focus on the return to equilibrium after a disturbance” (Berkes & Ross, 2012, p6). Within this engineering perspective, stability and persistence over time is viewed as beneficial for the continuation of the system (Grimm & Wissel, 1997).

An engineering resilience perspective can negatively impact on sustainability if it involves returning to a detrimental state (Derissen, Qaas & Baumgartner, 2011, Holling & Walker, 2003). This perspective is particularly relevant for regional areas experiencing imminent or potential ecological and economic disruption. The second perspective or ecosystem resilience addresses this situation in part as it relates to the amount of disturbance a system can absorb before changing to another stable regime. Examples where resilience definitions emphasise change over a return to the original state include: “The ability of individuals and groups to adapt to changing circumstances within a complex environment” (Morrison et al. 2017, p96) and “the capacity of the social-ecological system to sustain a desired set of ecosystem services in the face of disturbance and ongoing changes in social-ecological systems” (Biggs, et al. 2012, p. 423).

A second perspective on resilience refers to a state of moving between states of equilibrium. Similar to how the term ecosystems is used to counter a linear systems approach, the term panarchy is referenced as an antithesis to the word hierarchy to describe multiple levels of interconnected boundaries (Gunderson & Holling, 2002). The approach accommodates ecosystems that operate in ongoing transition between states of stability and change through predation, reproduction, competition, and nutrient dynamics. The emphasis is on the path of change rather than focusing on returning to or attaining a state of equilibrium. And yet the paths and interconnectedness that is a strength for the ecosystem can be a detriment. As Martin and Sunley note, “this implies that there may be a trade-off or conflict between connectedness and

resilience: the more internally connected is a system the more structurally and functionally rigid and less adaptive it is” (Martin & Sunley, 2011, p. 1306).

The third perspective of adaptive resilience, and the view taken by this research, does away with the concept of paths in favour of a permanent and constant evolutionary process. The perspective aligns with principles of complex adaptive systems as the domain of resilience – community, urban, culture, economic, etc. – responds to continuous change to avoid a permanent reduction in welfare or achieve a relative improved state of being (Wink, 2012). Definitions focus on adaptive capability rather than the change process or referencing state: “the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise” (Hightree et al., 2018).

The tensions related to control, capability, and intention are observed when the concept of resilience is applied to communities, as outlined by McCrea et al. (2014) describing three examples. First, there is an implied onus on the community to have the capability and capacity to exercise self-determination to respond. Second, there is an unlikelihood of a community being unified in their perceived position on resilience. Third, tension can exist between an aspirational desire for resilient strategies and current socio-political constraints. This research examines the role that the innovation ecosystem plays in resolving these tensions by building up capital and capability in the community. We now turn our attention to understanding the community context in which resilience is applied.

Community boundaries are socially constructed, multi-level, and overlapping, similar to what was described for innovation ecosystems. Common definitions of community include “a group of people who share common culture, values and/or interests, based on social identity and/or territory, and who have some means of recognizing, and (inter) acting upon, these commonalities.” (Gregory, 2009, p. 103–104) and “the local unity of a group of human beings who live their social economic, and cultural lives together and jointly recognize and accept certain obligations and hold certain standards of value in common” (Porter & Cantarero, 2014, p. 1094). Community as a structural construct or a ‘community of people’ can be positioned at a level between family and society (individual – family – community – sector - society) and contains observable characteristics such as size, density, or location (Murgaš & Klobučník, 2017).

Community typically has a place-based emphasis involving people living in a geographical area, communal resources, and the process in which individuals engage to exchange and distribute resources (Vaneekhautea et al., 2017) and there can be multiple communities within a shared geographic boundary. The attitudinal aspect of community can have many interpretations by those in a community and can form into a community of location, community of interest, or community of circumstance (Wilson, 2012; McAslan, 2010). Communities form from geography, interest, and membership. Participation can create a community of practice as individuals develop a shared repertoire, engagement, and joint enterprise (Wenger, 1998) and participate in collective thinking (Pyrko et al., 2017).

Individuals can have membership in community, be it defined by a physical, social, and/or political lens. McMillian and Chavis (1986) outline four characteristics of a ‘sense of community’: membership; influence; integration and fulfilment of needs; and shared emotional connection. Five attributes of community membership include boundaries, emotional safety or security, a sense of belonging and identification, personal investment, and a common symbol system. It is within this construct of community that resilience will be assessed in this research.

The collective value of community can be assessed through interchangeable constructs of community well-being (Kee et al., 2019) and community quality of life (Surgy et al., 2011), measured through surveys and assessments for place-based communities (Morton & Edwards, 2012; City of Whittlesea, 2017). In their Community Capitals Framework, Flora et al. (2004) outline seven capitals in a community including Built capital, Financial capital, Natural capital, Political capital, Social capital, Cultural capital, and Human capital (Flora et al. 2004). These capitals are proposed to contribute towards a healthy ecosystem, a vital economy, and social well-being (Emery et al. 2006). McCrea et al. (2014) highlight the overlap between community wellbeing and community resilience and reconciled conflict between the terms by presenting community wellbeing as a state and community resilience as a process. This aligns with the previously mentioned review by Noriss et al. who noted resilience is better conceptualised as an ability or process rather than an outcome (2008) and the permanent and constant evolutionary adaptive (complexity-focused) form of resilience.

Early research into community resilience emphasised resilience against natural disasters from a social-ecological systems level (McAslan, 2010; Bergstrand, Mayer, Brunback, & Zhang, 2015) and an individual agent psychology and mental health perspective (Berkes & Ross, 2013). The majority of the early work focused on acute shocks to the community, with less

work being done on slow-onset hazards associated with anthropogenic drivers of change such as socio-political or economic change linked to processes of globalization (Wilson, 2012).

While the process of resilience is described as continuous rather than moving between equilibrium and states, there are still cycles as creative destruction and collapse lead to reorganisation, innovation, restructuring, and uncertainty. Success results in exploitation and growth, which in turns leads to conservation, stability, and increased rigidity, depicted in Figure 2-1). Resilience can be considered highest during reorganisation and exploitation and lowest at rigidity (Pendall et al., 2008; Gunderson & Holling, 2002). A view of resilience as a continuous state of change is considered for this research.

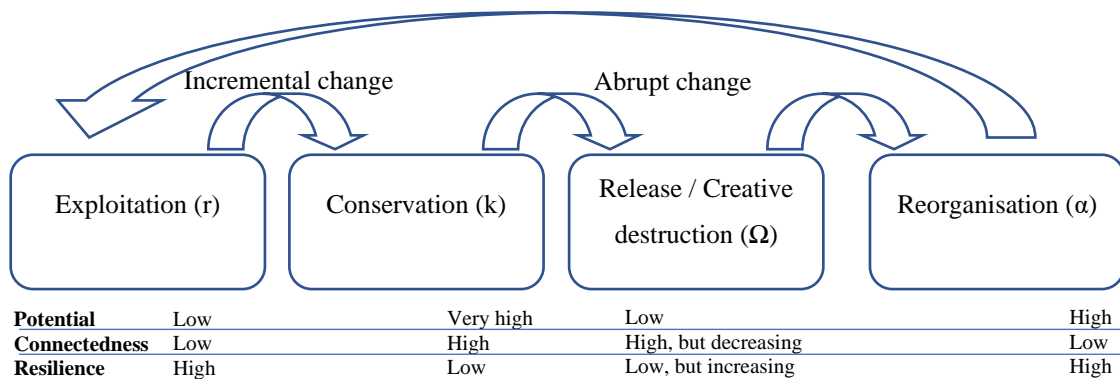


Figure 2-1 Resilience in community change cycles (adapted from Gunderson & Holling, 2002)

Whether community resilience is a state of a community or an ongoing process is one of several considerations for community resilience. Other community resilience considerations include resilience as a function of flow and network strength versus an inventory of stock and assets (Holling, 1973; Rose, 2009); resilience against short-term versus long-term impacts (Wilson, 2012); whether resilience can only be assessed in post-disaster conditions based on response and recovery or if it can be considered against pre-disaster activities (Comfort, 1994; Bruneau et al., 2003); and whether resilience is operational and inherent or if can be acquired and is adaptive (Rose, 2009).

2.5 Innovation hubs

Success in innovation activities and entrepreneur endeavours is difficult to achieve. Almost 40 per cent of businesses that start with four or fewer employees in Australia do not survive beyond three years (ABS, 2019b). The combination of starting a new business and developing an innovative product, service, or business model can be a challenge. These challenges are

compounded in regional areas by quality, access, diversity, and/or density of infrastructure, customers, technology, and skills inherent to lower population regional areas.

These challenges can be addressed through organisational sponsorship that provides support for entrepreneurs starting and building their business. Organisational sponsorship involves “planned environmental change by government agencies, business firms and universities to create new organisations and increase the likelihood of their survival - a deliberate attempt to provide a significantly higher and more stable level of resources for new organisations.” (Flynn, 1993, p. 130). Examples of organisational sponsorship roles include policy, infrastructure, financial capital, physical space, mentors, and structured programs.

These roles provide functions that act as buffering and bridging support for entrepreneurs. Buffering activities include building capability through direct transfer of knowledge, capital and labour as well as sheltering new firms from environmental threats and uncertainty to give them time to develop their organisational capabilities. Bridging activities include connecting emerging firms with industrial partners, established firms, other entrepreneurs, researchers, universities, financial capital, commercialisation programs and agencies, customers, and suppliers to more rapidly advance their business (Breivik-Meyer et al., 2019). The relationships between the organisational sponsor and the entrepreneur are mutually beneficial for both parties and resolve structural imbalances between the new endeavour and the system in which the entrepreneur is operating (Amezcuca et al., 2013).

Incubators provide organisational sponsorship, providing a set of buffering and bridging services for entrepreneurs. The concept of an incubator has expanded over the years from the first noted example in New York of the 1959 Batavia Industrial Centre offering physical space and guidance to new firms (Aerts et al. 2007). Some definitions emphasise established firms as incubators, where “any established firm is a potential incubator organisation, employing and influencing potential entrepreneurs who may ‘spin-off’ to establish their own firms.” (Cooper, 1971, p. 18) and incubators as “organisations where entrepreneurs work before they start their own firms” (Cooper, 1985, p. 76). Other definitions focus on the functions provided, describing “institutions that broadly provide subsidized space, management support, and local connections to new ventures” (Barrow, 2001; Amezcuca, 2013). The term has evolved to broadly describe “an overall denomination for organisations that constitute or create a supportive environment that is conducive to the ‘hatching’ and development of new firms” (Bergek & Norrman, 2008,

p. 20). The incubator creates value that is shared by the incubator, the incubatee, and the community in which the incubator operates (Table 2-3) (Hackett & Dilts, 2004).

Table 2-3 Incubator success factors and value (Hackett & Dilts, 2004)

Actor provider	Success factors	Actor recipient	Value delivered
Incubator	<ul style="list-style-type: none"> • Perception of success • Access to finance • In-kind financial support • Selection & monitoring for incubatees • On-site business expertise • Milestones with clear policies & procedures 	Incubatee	<ul style="list-style-type: none"> • Credibility • Diagnoses of business needs • Selection & monitoring • Access to capital • Access to network of experts / support systems • Faster learning/solution to problems
		Community	<ul style="list-style-type: none"> • Designed to cultural values of the community • Communication with community leaders
Incubatee	<ul style="list-style-type: none"> • Business attractiveness • Perception of success 	Incubator, Community	<ul style="list-style-type: none"> • Economic development • Technology diversification • Job creation • Profits • Viable firms • Successful products
Community	<ul style="list-style-type: none"> • Community support • Entrepreneurial network • Entrepreneurial education • Tie to a University 	Not defined	Not defined

Within this denomination are various forms of incubators. There have been multiple reviews that focus on explaining the different models (Hausberg & Korreck, 2020; Bergek & Norrman, 2008; Albort-Morant & Ribeiro-Soriano 2016; Hackett & Dilts 2004; Mian et al. 2016; Phan et al. 2005) and incubator typologies have developed over time, as outlined in Table 2-4.

Table 2-4 Incubator development over time

Timeframe	Benchmarking of business incubators (European Commission, 2002).	Technology Business Incubation: An overview of the state of knowledge (Mian et al. 2016)
1970s	<ul style="list-style-type: none"> • Managed workshops • Enterprise agencies • Industrial estates 	Science research parks: tech-garden type stand-alone facilities, incubators, economic development and restructuring estate centres
1980s	<ul style="list-style-type: none"> • Business centres • Science parks • Consolidated business incubator concept to include previous concepts 	Science research parks with technology incubators, mentoring, networking, and commercialisation enablers, emergence of virtual incubators
Mid-1990s	<ul style="list-style-type: none"> • Multi-purpose incubators • Specialised incubators 	
Late-1990s	<ul style="list-style-type: none"> • Technology incubators • Incubators without walls • Sector-specific incubators • New economy incubators • Virtual incubators 	
2000s to 2015		Multi-purpose mixed use science research parks, specialised incubators, innovation centres integrated in parks with enhanced access to resources, accelerators

The result is the creation of a taxonomy of different ‘species’ within the incubator ‘family’. The European Commission describes a typology based on technological level and management support (European Commission, 2002). Gerlach and Brem describe incubation as a process defined by pre-incubation, main incubation, and post-incubation activities (Gerlach & Brem, 2015). This evolution is a natural adaptation of the complex system, with incubator models specialising in programs, focus areas, and business models. A 2004 report on Case studies of Australian small business Incubators and their impact identified 83 general purpose incubators, ten high technology incubators, and several other special-purpose incubators. The list of incubators includes innovation centres, business centres, industrial parks, shared workspaces, and art centres (ANZABI, 2004). Grimaldi and Grandi outline different characteristics of incubators, summarised in table 2-5 (Grimaldi & Grandi, 2005).

Table 2-5 Incubator characteristics

Dimension	Characterising variables
Model	Focus on reducing start-up costs for small entrepreneurial initiatives that target local markets and are more anchored to the old economy; Designed to accelerate the start of highly promising entrepreneurial initiatives that are attractive in terms of investment size
Institutional mission / strategy	profit orientated; non-profit
Industrial sector	Generic; University research related; Specific (high-tech related)
Location / proximity	Renewal area; University; Industrial estate; Polytechnic
Market	Regional; National; International
Origin of ideas	Internal; External
Phase of intervention	Pre-incubation business; Business concept definition; Early growth; Acceleration; Independence
Incubation period	Short; Medium; Long
Sources of revenue	Public funding; Rent; Fees; Equity
Services offered	Logistic services; Training; Information; Advertisement for local visibility; Access to technical and scientific knowledge and academic facilities; Day-by-day management support; Advanced consulting services; Networking; Funding
Management teams	Acting as intermediaries. Not directly involved in new ventures; Directly involved in the new ventures with the provision of personal: (a) capital; (b) knowledge; (c) management skills; (d) day-by-day support

Innovation hubs are often considered as a form of a co-working office space and related to technology with terms such as tech hub, digital hub, or ICT hub (Jimenez & Zheng, 2017). Innovation hubs go beyond the traditional coworking model through dedicated resources to provide access to connections and networks, a space and community of like-minded individuals, and skills development all related to entrepreneurial activity (Gathege & Moraa, 2013). Various taxonomies have been created for innovation hubs based on the capacity of their programs, the focus on enterprise life-cycle, the technology focus, the industry or business model focus, and the funding source. Examples of categorisations include: traditional science parks, activity-based innovation centres, and co-creation hubs (Olugbenga, 2016); government-led hubs, civil society led hubs, academic institution led hubs, and hybrid hubs (World Bank Group, 2016; Schopfel, Roche & Hubert, 2015); cluster hubs, company hubs, and country hubs (de Beer, J. , Millar, P., Mwangi, J., Nzomo, V. & Rutenberg, I. 2017); and Urbanpreneur Pad,

Digital Den, Corporate community, Townhall terminal, Executive establishment, Social studio, and Creative collective (Mahlberg & Riemer, 2017).

The functions of the hub can be described as a place where “technologists, computer scientists, hackers, web developers and programmers congregate to network, share programs and design to bring their ideas to fruition” (Gathege & Moraa, 2013). This process benefits multiple stakeholders through: creating a competence profile based on globally recognized competences and business based on them; creation and application of new knowledge and technologies; attraction of talents and investments; access to globally operating companies based on the competence profile; and securing the region’s success in constantly changing markets (Hautamäki & Oksanen, 2015).

These outcomes can be realised through hubs not simply as dedicated physical spaces, but “‘human spaces’ which facilitate collaboration between individuals and organisations” (Kovács & Zoltán, 2017). The emphasis on the human element allows for an expanded inclusion of virtual or online hubs, “pop-up” locations such as a pub or library activated by a local group or program, and individual leaders who bring people together in a community to support individual projects and businesses entrepreneurship and innovation (Schopfel, Roche & Hubert, 2015; Cabras, & Mount, 2016).

A Finland study categorised spaces by business model (for profit or not for profit) and level of user access (public, semi-private, and private), resulting in six categories: public offices, third places collaboration hubs, co-working hotels, incubators and shared studios (Kojo & Nenonen, 2016). A Japanese research project created a typology based on sponsorship of private, government, academic, and non-government, further expanded to: Business Innovation Centres;, University Business Incubators, Corporate Private Incubators, Independent Private Incubators, Virtual Incubators. Metrics measured included strategic focus, sponsorship source, type of business, service mix, financial services, role of government (Tsai, Chung & Liu, 2017).

The common value from the different expressions of the innovation hub is a localised impact from place-based context, the influence of the innovation hub host or facilitator, and the emphasis on startups or firms with high-growth potential over traditional SMEs and self-employment as the type of entrepreneurial outcomes (Fuzi, 2015; Isenberg, 2011). To provide these services, innovation hubs receive financial supported from stakeholders including corporations, universities, government, philanthropic groups, venture capital, and private

individuals. While each stakeholder will expect different outcomes for their investment, an impact on the local community is inevitable (Jimenez & Zheng, 2017).

This investment is increasing across Australia, although metrics specific to innovation hubs are difficult to find. Research by property management firm Knight Frank found the number of coworking spaces in Australia grew by 297% between 2013 – 2017 to 307 (Paterson & Preece, 2017). Not all these spaces would be considered innovation hubs and some virtual or distributed innovation hubs would not be represented as a coworking space. The reported increase in coworking spaces provides an indication of the rapid increase in interest and investment in spaces targeted at early-stage companies requiring flexible working conditions. Other indicators of interest include government investment, such as the federal government's \$8.7 million investment in over 33 locations through the Incubator Support Program (business.gov.au, 2018), South Australian government's investment of \$476.2m over 5 years into the innovation hub Lot Fourteen (South Australia Government, 2019), the Queensland government's \$1.2 million investment into 20 regional innovation hubs (Queensland Government, 2019), or investments into local government owned innovation hubs Fire Station 101 in Ipswich and the Rockhampton Smart hub.

The impact of an innovation hub can be more pronounced in non-metro areas, which tend to be challenged by lower density of population and specialised talent, low industry and demographic diversity, migration changes, and infrastructure deficit. These aspects are particularly relevant when considering the role that technology, talent, and diversity play in new entrepreneurial opportunities (World Bank Group, 2016). Research into the contribution of Irish pubs in entrepreneurial embeddedness highlighted the value of "hubs as pubs" for productivity and competitiveness, entrepreneurial motivation, access to information, new opportunities and support for new businesses, and creation of linkages between economic and social spheres (Cabras & Mount, 2016). Innovation hubs create a channel for what can be considered an adaptable yet consistent "transition corridor" to external markets, demonstrated to improve community resilience (Wilson, 2014). The role of the innovation hub is considered as an actor in innovation ecosystem models, contributing to the REDI entrepreneurial aspirations, attitudes, and abilities variables, and the Aspen Institute's Entrepreneurial Ecosystem Diagnostic Toolkit determinants, performance and impact variables (Szerb et al. 2013; Szerb et al. 2015; Aspen Network of Development Entrepreneurs, 2013).

Innovation hubs also have a positive impact on communities in their capacity as a coworking spaces. As a form of a third space, coworking provides a sense of community through endorsing, encountering, and engaging (Garrett et al. 2017), a point for finding people, ideas and other resources (Waters-Lynch & Potts, 2016), a place to develop strategies for precarious work (Peuter et al. 2017), contribute towards economic development (Holm, 2017), and provide a new form of urban social infrastructure (Merkel, 2015).

Jiménez & Zheng take a line of research similar to this current research project to focus in their review of innovation hubs and community outcomes in South Africa (2018). They emphasis the function of the innovation ecosystem in institution building, technology diffusion, social inclusion, and expanding capabilities. The innovation hub contributed towards creative thinking, collaboration and learning, a sense of community, enhancing agency, and supporting gender equality.

Another research project that shared similar focus on local economic impact focused on spaces in Milan (Mariotti, Pacchi & Di Vita, 2017). Researching 68 coworking spaces in Milan, the researchers considered the influence of location, sector, and size of coworking space, and location size, density, employment, number of research centres and universities, population composition (i.e., age, classes, and nationality), and information on accessibility to public transport. While urban effects were identified for increasing density and potential for collaboration, the longer-term economic development impacts were not identified.

A research project in Shanghai explored local impact of across 15 co-working spaces. Actors include: Managers and founders of coworking offices, entrepreneurial project-oriented groups, “Internet plus” entrepreneurial projects, local government, venture capital companies / holders. Expected outcomes include return on investments in the future, get more money based on the success of the projects, and successful commercial companies based on projects. Community outcome was promotion of employment rate and innovative performance. indicators identified include: Space size, number of tenants, age, gender, occupation, location, age, education level, gender, local or non-local, past entrepreneurial experience, and membership types (Wang & Loo, 2017).

The functions of the innovation hub that deliver innovation outcomes require additional resources and investment. Nearly 60 per cent of coworking spaces are not profitable (Mariotti, Pacchi & Di Vita, 2017). This percentage would be expected to be greater for innovation hubs based on the need for additional resources required for entrepreneurial outcomes as compared

to only providing space for coworking. Further, there are no consistent ways to report and benchmark on how the actual impact of innovation hubs in supporting local entrepreneurs.

A study of spaces in remote Welsh communities identified that regions with lower entrepreneurial density and capability require a more facilitated model (Fuzi, 2015). The extra facilitation and low profitability from traditional membership models require additional revenue sources. In a study of hubs in Hungary, it was found that after 18 months, one hub was operating at 20% capacity and 50% of its income was derived from programs (Kovács & Zoltán, 2017). Financial sustainability requires multiple income streams and sponsorship, which can be linked to local community outcomes.

The sustainability of innovation centres has been a topic of discussion since place-based innovation and research centres emerged in the 1950s. Not only do many hubs operate with uncertain business models, but they are also impacted by competition and demand from the external environment just like any other business. Considering the previously noted rapid expansion of innovation hubs in the Queensland market, it is worth reflecting on an excerpt from a 1983 United States Senate hearing on the role of technology in promoting industrial competitiveness:

“The rapid growth of these parks has raised a question of whether there might be too many in relation to the availability of tenants. A report prepared by Ohio State University in 1980 found that twenty-seven university-related research parks have been started since 1951. Not all of these have succeeded however. The report found that of the twenty-seven, six had clearly succeeded, sixteen had failed, and five were "in-between". There will probably not be enough "high tech" industry to satisfy all the industrial development projects attempting to attract such companies.” (United States Congress, 1983, p231)

The focus of this research is on the innovation hubs as a type of incubator and how their role contributes towards community resilience in regional areas. As a distinct form of incubation, innovation hubs provide a unique form of organisational sponsorship that has garnered increased attention and investment into a financially challenging model. Section 4.2 examines the recent expansion of the innovation hub in Australia. Section 4.4 provides an explication focus on innovation hubs to develop a determination framework on what might and might not be considered an innovation hub.

2.6 Theoretical framework

This literature review examined the theoretic and applied development of innovation ecosystems, community resilience, and incubators with an emphasis on innovation hubs. A growing body of research explores the connection between entrepreneurs and place-based resilience in relation to natural disasters, economic shocks, and marginalisation (McNaughton & Gray, 2017; Simmie, 2014). Past research has examined the resilience of the innovation ecosystem itself (Pinto & Nogueira, 2018) and highlights the connection between entrepreneurial activity and community resilience, with a focus on non-metro regions (Steiner & Atterton, 2015). Emerging research is identifying the role of the innovation hub in contributing to local economic growth (Jiménez & Zheng, 2018). There remains a gap in the analysis of specific innovation ecosystem actor influence on community resilience.

When considering the influence between a specific innovation ecosystem actor and community resilience, research into innovation ecosystems and representative models have varying contribution towards community outcomes and reference to the actor of the innovation hub. Cavaye (2015) presents a comprehensive outline specifying characteristics of resilient communities, the actors involved, and their specific roles. However, the specific function of the incubator, much less the type of incubator of the innovation hub, is absent from the outline presented in Table 2-6 below:

Table 2-6 A summary of the participants in regional development and their contribution to key issues (Cavaye, 2015)

Participant	Key Issues							
	Infra-structure	Policy	Planning and Coordination	Economic Development	Service Delivery	Community Capacity Building	Natural Resource Management	Funding
Federal Government	***	***	**	**	*	**	**	***
State Government	***	**	**	***	***	**	**	**
Local Government	***	*	*	*	***	***	*	*
Community Organisations including Indigenous groups	*	*	*	*	***	***	**	
Universities, Research Organisations and R&D Corporations		***	*	*		**	**	**
Industry Bodies and Corporations e.g. Agforce, MLA		***	**	**	*	*	*	
Business	**	*		***	**	*		
Natural Resource Management Groups e.g. Regional Bodies		**	**	**		***	***	**

- * Some involvement in the issue
- ** A key contributor to the issue
- *** Participants has a key responsibility for the issue

Others such as Delgado and Porter (2017) considered the impact of clusters on economic performance and examine cluster strength (employment, number of businesses, presence of buyers and suppliers) and breadth (number of specialised industries) with strong inter-firm

linkages (primarily selling business-to-business as compared to selling business-to-consumer). Metrics include industry annual employment growth, employment, industry specialisation, cluster employment specialisation, cluster patent specialisation, cluster specialisation suppliers, cluster specialisation buyers, and cluster breadth. Cluster emphasis tends to focus on entrepreneurial outcomes and the organisational actor, which assumes local community benefit and does not explicitly identify the role of the intermediary actors that facilitate the clustering effect. Cluster literature considers rural community resilience as a balance of economic, social, and environmental capital, with the role of innovation ecosystems seen as providing value in diversifying farms in regional and rural areas (Wilson, 2010).

Innovation hubs have the potential to influence community resilience through the introduction of new types of economic actors. Responding to market disruptions can require a community to change to something new rather than return to a previous state. Creating new businesses from incumbent businesses in the region does not introduce the structural change required for long-term sustainability. Introducing new entrants provides for the creation of new supply chains, networks, technologies, and ways of thinking that brings about deeper entrepreneurial capability and capacity (Neffke et al. 2018).

Models and related indicators such as the previously identified aggregate list from Sharfi (2016) prove useful when considering how innovation ecosystem actors influence community resilience. The dimensions in Sharfi's aggregated list align with what others have identified as worthy consideration of qualitative case study research focusing on community resilience, including 1) Governance responses; public-private collaborative efforts; private sector efforts organized on a public level; 2) Industry or firm responses by firms or industries in the region; and 3) Institutional characteristics that condition, constrain, or promote effective action to respond to economic shocks, structure, history, and culture, such as the extent to which entrepreneurship is valued, etc. (Hill et al., 2008). The aggregate list from Sharfi also includes an individual and social dimension.

Innovation ecosystems can be expected to influence indicators of community resilience that relate to private investment, locally owned businesses and employers, employment rate and opportunities, and openness to micro-enterprise. Other community resilience social and infrastructure dimensions impacted may include diverse and reliable information and communication technology (ICT) networks, volunteerism and civic engagement in social networks, and degree of connectedness across community groups.

It is also useful to identify gaps where innovation ecosystems appear not to influence or even inhibit community resilience indicators, including the availability of other community services, personal health and well-being, aspects about the built environment such as housing or transport, other culture attributes such as sport or the arts, and demographic details of population and income support. Indicators such as employment are considered in innovation ecosystem frameworks but often only as outcomes rather than the influence of current employment conditions on innovation.

Figure 2-2 presents the theoretical framework underpinning this research and identifies the three research questions.

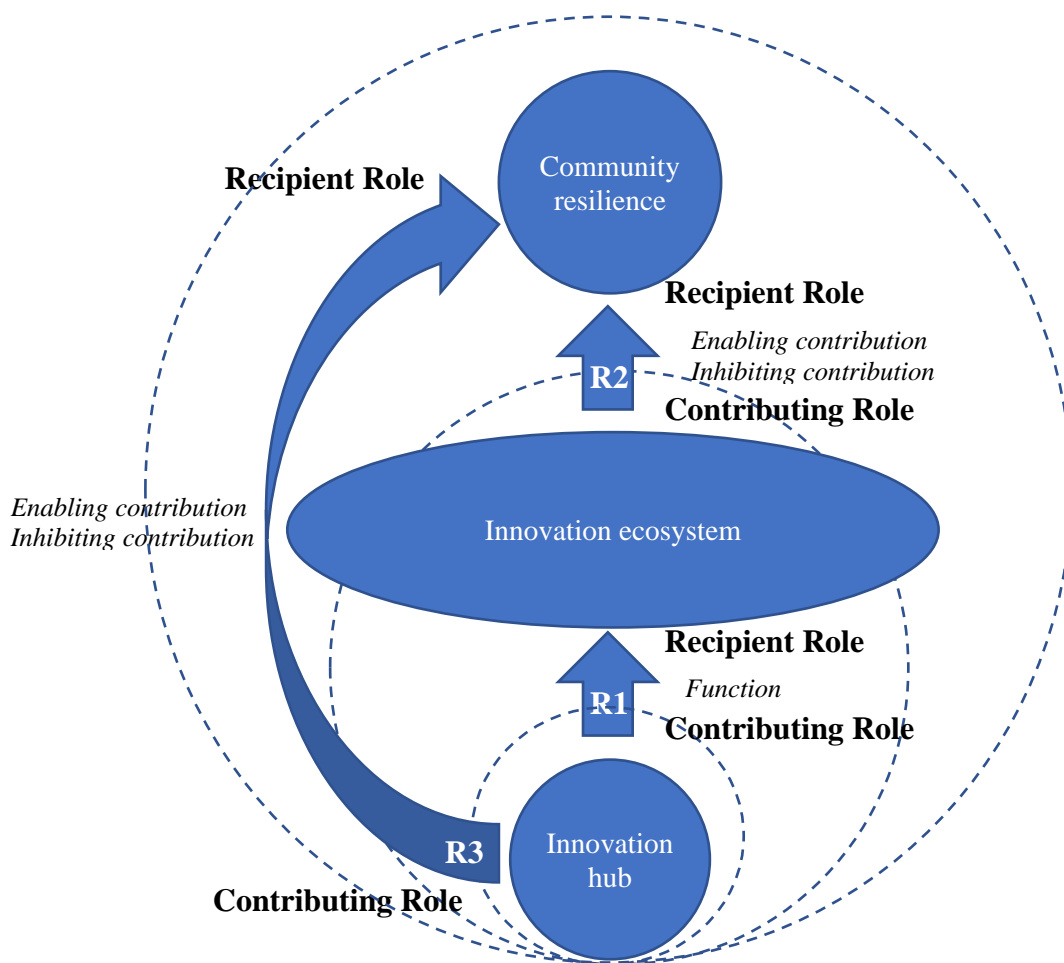


Figure 2-2 Theoretical framework

2.7 Conclusion

Chapter 2 has examined the three constructs of the innovation ecosystem, community resilience, and the innovation hub to understand the ‘real’ and ‘actual realities. The chapter

also identified gaps in literature and observable understanding of the contribution of innovation ecosystems and innovation hubs on community resilience. While there is a growing body of work to understand different forms of incubators, there also remains an opportunity to review and clarify the functions of the innovation hub in the ecosystem. Building on the literature review, this chapter finally presented a theoretical framework identifying the key concepts and the research questions. Upon this foundation, Chapter 3 will outline the research objective and questions and the methodology adopted for this study.

CHAPTER 3: RESEARCH DESIGN AND METHOD

3.1 Introduction

Chapter 3 describes the methodology and techniques used in this research. The Chapter begins by summarising the research objective and questions. Section 3.3 details the philosophical approach guiding the research, including detailing how systems theory, critical realism, and actor network theory provide the ontological and epistemological position. Next, the research design section describes the three-stage critical realist approach of explication, retroduction, and empirical corroboration, including results from the first two stages that inform the methodology and coding framework. The third stage of corroboration is then detailed, including the sample selection using an initial leader or elite in the community followed by snowball sampling. The data collection and analysis section describes the coding process and the use of social network analysis for data collection and analysis before the chapter concludes.

3.2 Research objective and questions

The objective of this research is to explain the impact of the innovation ecosystem on community resilience with an emphasis on the role of the innovation hub. Three research questions set out to achieve this objective:

RQ1: What is the role of the innovation hub in an innovation ecosystem?

RQ2: How do innovation ecosystems contribute towards community resilience, and what are the enabling and inhibiting contributions?

RQ3. What indicators of community resilience are influenced by an innovation hub, and what are the enabling and inhibiting contributions?

3.3 Philosophical approach

This research is grounded in critical realism as an ontological mid-point between positivist and interpretivist perspectives (Zachariadis et al., 2013; Hoddy, 2019). A positivist perspective focuses on the institutions, views society as a self-regulating system, searches for regularities and disequilibrium to established models, and promotes a single reality that exists independent of those experiencing it. Conversely, interpretivism focuses on the discourse and culture, views society as socially constructed action, understands social complexity defined through multiple perspectives, seeks to uncover the meaning of social interactions (Sovacool & Hess, 2017; Hurell, 2014). Critical realism (CR) bridges the gap between these two positions, providing a

realist ontology with an interpretive epistemology and aligning with a progress-orientated mandate as compared to deconstruction towards uncertain outcomes (Parker, 1995; Hoddy, 2019). CR “rejects both the naive optimism of those expecting to uncover law-like regularities from empirical data and the defeatism of those who deny any possibility of generalising our understanding of idiosyncratic phenomenon such as entrepreneurship” (Blundel, 2006, p. 49). The fundamental tenet of CR is the use of causal language to describe the world. The world is understood within three interrelated domains of reality: the empirical (human actors’ observations, perceptions, and sensations of reality); the actual (social events resulting from mechanisms and causal powers embedded in a structure of entities); and the real (the structure of entities including causal powers and generative mechanisms both realised and unrealised or hidden) (Venturini, 2010; Vicsek et al., 2016). CR acknowledges that observation is fallible and encourages the collection of further data for a full understanding of a social situation (Easton, 2010).

The critical realist approach is applied in this research in combination with systems thinking and theory as well as Actor Network Theory (ANT) to further accommodate the emerging, complex, and constantly changing nature of innovation ecosystems. Systems theory is the metatheory guiding the research, particularly in consideration of the three main constructs of the innovation ecosystem, community resilience, and the innovation hub. Systems thinking places an emphasis on interdependencies and the network in which individual actors are situation (Mele et al., 2010; Bertalanffy, 1968) and is generalisable while also being able to take into account interdependence, openness and boundaries, and the dynamic of equilibrium-seeking versus structural growth and changes from internal and external stressors (Hill, 1971).

The inclusion of ANT is to trace connections through structures which are constantly made and remade and allow for an emphasis on human and non-human actors (Elder-Vass, 2008). ANT allows the relationships between actors to emerge within a loosely defined framework and avoid prescribing the nature of the relationship between actors. ANT does not in itself make substantive claims but is more general principles needed to carry out an observation (Sayes, 2014). The model allows observation beyond a single theory from as many viewpoints as possible and listens to other actors more than the viewer’s presumptions (Venturini, 2010). The use of ANT allows the research to accept how ‘messy’ reality is prior to accepting ‘cold, hard facts’ of a definition (Vicsek et al., 2016, p. 79).

ANT views all humans and non-humans as equal actors, whose value is defined reflexively by each actor in the group. The notion of group is fluid, being continuously made and remade with permeable boundaries, defined by the value of work achieved by the group. The groups form an assemblage comprised of not just actors and things but of our discourses about them (Elder-Vass, 2015). Inclusion of non-human actors and fluid groups is particularly relevant within an innovation ecosystem context as relationships are continuously formed and re-formed based on social relationships and value rather than institutionalised contracts. Roles are dynamic and adaptive rather than prescribed in a position description.

Each actor has agency, in that actors are doing something, have a figure for representation, are opposed to other competing agencies, and present their own theories of action to explain their effects. In the context of the innovation hub, this includes not just the individuals but the physical space, technology available, structured programs, branding, and more. Each actor is defined based on anything that modifies a state of affairs by making a difference (Latour, 2005). Non-humans are actors with agency, rather than ‘hapless bearers of symbolic projection’. An expanding and changing view of what is “social”, and progress towards understanding what new institutions, procedures, and concepts make up the definition of what is social (Latour, 2005, p. 10). ANT serves to view all actors equal with value defined through reflexivity by their perspectives.

ANT serves best “in situations where innovations proliferate, where group boundaries are uncertain, and when the range of entities to be taken into account fluctuates.” (Latour, 2005, p. 11). This is an accurate description of interactions that occur in innovation ecosystems between physical spaces, programs, investors, corporations, universities, government agencies, service providers, and others involved in supporting entrepreneurs and progressing new ideas to market. ANT has been applied in previous innovation research towards the agency, process, and opportunity of entrepreneurship and research and development activities (Korsgaard, 2011); how entrepreneurs sustain projects and receive input from allies (Murdock & Varnes, 2017); developing entrepreneur peer-learning networks (Smith et al., 2017), and development of R&D production frameworks (Chen & Hung, 2015).

The use of ANT allows all actors to emerge and be treated equally. The weighting of strong or weak associations or stable or unstable connections is made based on the relative value perceived by each actor. This application is particularly relevant in innovation ecosystems,

where relationships are formed and broken based on levels of value and trust (Longo & Giaccone, 2017).

The combined use of ANT and critical realism allows for an understanding of actors without the bias of a predefined or prescribed model. For example, rather than predefining an interviewee as a mentor, investor, or entrepreneur, their role in the ecosystem is defined by their narrative and communicated behaviours related to events. The collective stories represent the types, nature, and characteristics of actors in the innovation ecosystem. An overview of the philosophical approach is outlined in Figure 3-1.

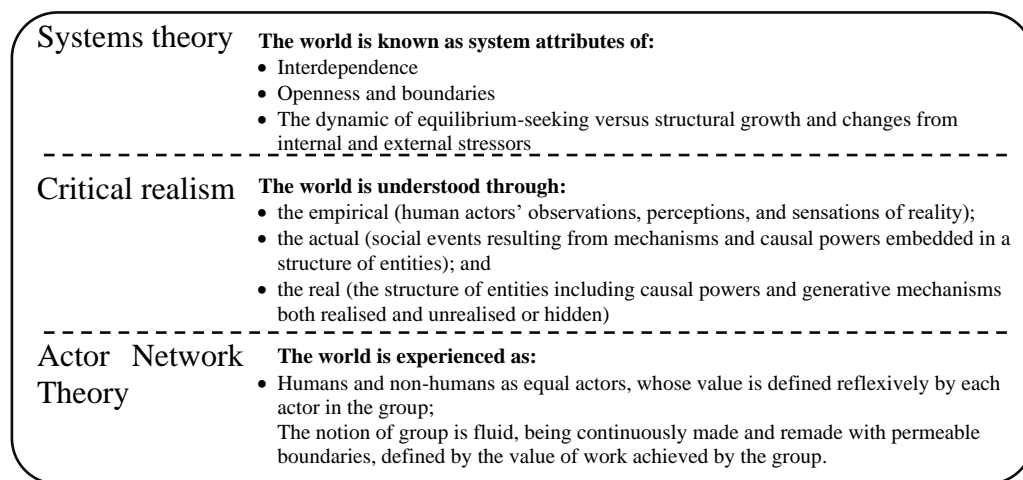


Figure 3-1 Research philosophical approach

3.4 Research design

The research uses a mixed-method approach aligned with the three critical realist stages of explication, retrodution, and empirical corroboration (Hu, 2018). Under a CR paradigm, data is collected within a structured framework that explores the causal explanations for events. The approach of observation and data collection captures the structured forms of relationships and conditions that caused the events to happen and the mechanisms or deep processes in which actors make events happen. The emerging properties of the actors are identified, and the relationships between actors understood as to whether the relationship is necessary (one entity will affect another) or contingent (one entity may affect another) (Easton, 2010). Applied to entrepreneurship, CR accommodates the necessary focus on context. Location and history are important. There is an emphasis on the spatial and temporal context in which the entrepreneurial activity occurs, spanning multiple disciplines (economics, psychology, sociology, anthropology, geography, organisation studies) and levels of analysis (individual, group, organisation, industry, and society) (Blundel, 2006).

The explication stage developed an understanding of the ‘real’ reality, or the inherent properties of the three constructs of innovation ecosystems, community resilience, and innovation hubs, and was established through a review of literature, existing case studies, and available data about each construct. The retrodution stage provided an understanding of the ‘actual’ reality through observation of the observe and hypothesis about the constructs and their relationships. The corroboration stage provided an empirical reality based on the understood experiences of actors in the system through qualitative interviews (Hu, 2018).

The selection of the research design was based on the nature of the object of study, specifically the dynamic nature and ambiguity of the innovation ecosystem, the diverse nature of the actors, and the scope of the geographic boundaries (Blundel, 2006). The design is both extensive through a large number of interviews and roles as well as intensive to focus on the nature of causality and individual circumstances between actor relationships (Sayer, 2000). The three stages are both sequential and iterative and all three outcomes – what is known from literature, what is observed and hypothesised about from the environment, and the lived experiences shared by actors – are all treated as unique and integrated realities. As such, the approach borrows on but is not specifically aligned with established mixed-method designs of triangulation (directly compare and contrast quantitative statistical results with qualitative results), embedded (one data set provides a supportive, secondary role in a study based primarily on the other data type), explanatory (qualitative data explains or builds upon initial quantitative results), or exploratory (the results of the first method (qualitative) can help develop or inform the second method (quantitative)) (Creswell, 2006).

The three stages of the research approach outlined in Figure 3-2 follows the critical realism framework based on frameworks applied by Fletcher (2017), who used CR for qualitative research.

Method

Critical realism Data is collected within a structured and iterative process of explication, retrodution and empirical corroboration to explore the causal explanations for events

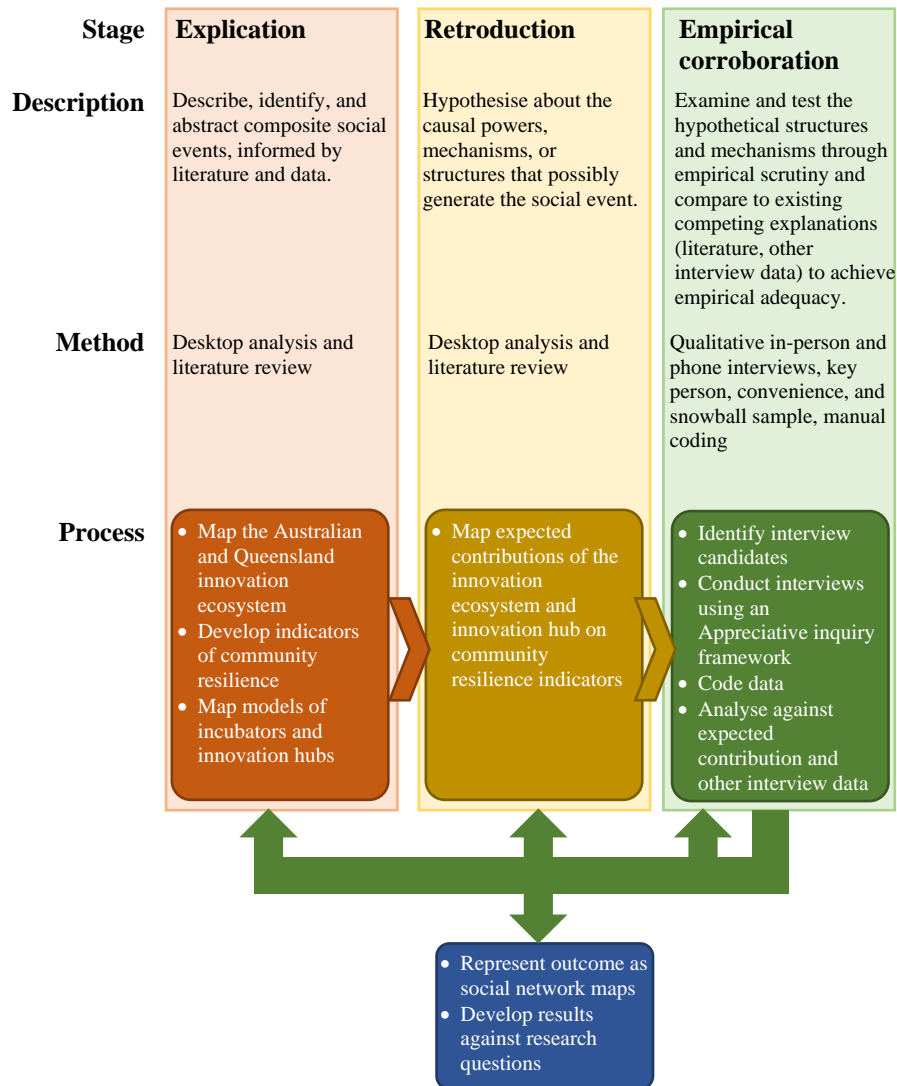


Figure 3-2 research methodological approach

3.5 Explication and retrodution

The explication and retrodution stages developed an understanding of literature and what could be observed from the three constructs of the innovation ecosystem, community resilience, and innovation hubs in the Australian context. Literature related to innovation ecosystems was reviewed to develop an understanding of the type of roles, actors, and indicators, followed by an in-depth review and analysis of the Australian innovation ecosystem. This process informed but did not limit the selection of interviewees by their roles in the ecosystem, including schools, universities, government, chamber, entrepreneurs, investor groups (angels), and innovation hubs or spaces.

Community resilience literature was reviewed to understand conceptual models and develop an initial coding framework. Eleven models were reviewed through this research (Appendix 3) before applying the work of Sharfi (2016), who aggregated 36 instruments into the framework used in this research. This framework was used to develop the dimensions and indicators for the coding of the corroboration stage. Literature relating to innovation hubs was reviewed to understand what can be known from research about incubator taxonomy. Australian incubators were reviewed and mapped to understand what could be observed in the current context. Finally, in an integrated yet distinct retrodution stage, a hypothesis was developed about the enabling and inhibiting contributions of innovation ecosystems and innovation hubs on community resilience in the Australian context. The process and results of the explication and retrodution stages are detailed in Chapter 4.

3.6 Sample selection

Challenges are inherent in the process of selecting interviewees when the aim is to understand perceptions in a social network such as a regional innovation ecosystem, as outlined by Scott (2017). Firstly, there may be a limited representation of a type of actor in a region, limiting the amount of data collected and over or under-emphasising key points for the region. Many regions have a single coworking space or chamber of commerce, often represented by a single individual who may be part-time and share roles. Secondly, referrals from a snowball sample that begin with an elite respondent may omit fringe or emerging networks. This can create a view that is biased to like-minded individuals. Interviewing referrals from the leader of the innovation hub may result in an overly positive view of the hub based on a network of those favourable to the leader.

Thirdly, data collection that presumes certain roles risks attributing characteristics to the actor that may not reflect reality. For example, categorising a respondent as a local government economic development department employee presumes the nature of an employment relationship and the organisational structure of the local government. This then presents a risk of presuming views of local government employees.

This research utilises three approaches to address these challenges. First, the research does not presume to report on the global characteristics of the innovation ecosystem, such as size or composition. The research presents the network as the collective views of actors and individual relationships. Second, multiple initial contacts were used in each region to provide more than one starting point for a snowball sample. Roles such as the chamber of commerce, local

government, coworking space, innovation hub, Technical and Further Education (TAFE) or training centre, or local corporation, and makerspace were all engaged separately to access various networks. Finally, the application of actor network theory and initial open questioning allows respondents to define their role in relation to the network. This resulted in less initial generalisation but allowed a more accurate reflection of the nature of the network.

The sample selected was based on a geographic representation and representative roles relating to support for entrepreneurial activities. Guidance for qualitative study sample sizes is that around 20 to 60 knowledgeable people are enough to uncover and understand core themes. Purposive sampling is appropriate for intensive and critical studies (Bernard et al., 2017).

Interview samples were selected based on a cohesive 'region', defined as "an area that contains a cohesive network of trade and commerce; local commuting for jobs and shopping; common access to services; and association of community activities" (NSW Government, 2017, p. 11). The concept of region for this research borrows on the definition of functional economic regions (FER). The Australian Productivity report considering that identity and function play a role in defining regions, in that: people often travel between areas for work or to access services; businesses hire workers, purchase services, and sell products and services across areas; and governments and people interact economically, socially and culturally across areas. FERs benefit as they "facilitate better evaluation and implementation of regional strategic plans and development policies." (Productivity Commission, 2017, p. 5). The term 'regional' is used to consider areas outside of what would be considered a capital city's functional area.

Following the initial engagement of a leader or elite in the community, theoretic sampling led to new interview opportunities based on availability, new opportunities presented by the data, access to new networks, walking through spaces and places, and other engagements in the regions (Glaser & Strauss, 1967; Thornberg & Charmaz, 2013). For example, an interview with a leader in high school entrepreneurs in one region highlights the role of a central coordinating function among high schools. This was tested with an entrepreneur working with youth in another region, who mentioned a local leader performing a similar function leading to another interview.

Interviewees were contacted directly as well as attracted by media, marketing, networks, and social media. The research project was promoted through the website <http://www.startupstatus.co/> to allow communities to self-nominate and allow for additional

resources to support the research. The total population of available actors was identified through the explication stage of the research focused on the innovation ecosystem.

In total, 147 interviews were conducted across 16 regions. Interview respondents identified with 27 primary roles. Participant gender was not factored in the selection process or considered as part of the hypothesis questions but was identified. Of the participants selected, 62 per cent were male, and 38 per cent were female. Table 3-1 shows interviewee numbers by region, role, and gender.

Table 3-1 Interviewees by role, gender, and region

ROLE	REGION																		TOTAL																
	Atherton	Australia	Brisbane	Bundaburg	Cairns	Gladstone	Gold Coast	Goondiwindi	Ipswich	Mackay	Queensland	Rockhampton	Sunshine Coast	Toowoomba	Townsville	Whitsundays	M	F																	
Accelerator - Incubator program			1						1								1	1	2																
Advocacy, Education, and Support organisations					1	1				3		1	1	1			7	1	8																
Business Enterprise Centre															1		1	0	1																
Chamber of Commerce				1				1	1			1			1		3	2	5																
Connection and Virtual Hubs						2											0	2	2																
Coworking space			1										1	1			0	3	3																
Creative hub													2	1			2	1	3																
Economic Development Body					1									1	1		3	0	3																
Ecosystem leader							1	1	1	2			1	1			3	4	7																
Education program					1												0	1	1																
Employee								1							2	1	3	1	4																
Entrepreneurs	1			2	1	3	2	2	1	2	1	6	3	1			25	10	35																
Established business									1				1				0	2	2																
Government - Federal						1							1	1			2	1	3																
Government - Local				1	1					1	1		1	1	1		6	3	9																
Government - State													1				0	1	1																
Hackerspace Makerspace				1	1			1		1	1			2			5	2	7																
High schools													1				1	0	1																
Industry and technology communities						1											1	0	1																
Industry association and peak body		1	1				2				1			1	1		3	4	7																
Innovation hub			2	1	2	2		2		1	1		1	4			9	7	16																
Investment - Capital								1				1		1			1	2	3																
Large corporations and multinationals				1		1	2		1	1							4	2	6																
Local retail				1													1	0	1																
Mentors / Coaches													1				0	1	1																
Service provider					1			1	1	1		1	2		1		6	2	8																
Universities				1		2				1			1	1	1		4	3	7																
TOTALS BY GENDER	0	1	1	1	3	1	8	3	8	11	5	4	4	4	3	5	13	7	5	2	1	0	10	5	20	8	3	2	5	2	2	0	91	56	147
TOTALS	1	2	4	11	19	9	8	8	8	20	7	1	15	28	5	7	2	147																	

3.7 Semi-structured interviews

The research method captured data through qualitative interviews. Referencing the approach Lee and Chen (2011) outlined to using ANT and AI in online social networks, AI is partnered with CR and ANT to provide a positive framework to the questioning and take advantage of principles inherent to the AI approach. These principles are outlined below:

1. Construct each actor's reality through narratives.
2. Test each actor's story with other actors and literature for open interpretation.
3. Acknowledge that change will happen as questions are asked, with the interview becoming part of the ecosystem and building the narrative over the course of the research.
4. Emphasise a positive future state, emphasising the actor's role in the outcomes.
5. Focus questions on positive aspects of the current reality and future state, allowing negative sentiment and challenges to emerge in a constructive context.
6. Frame conversations within the context of the innovation ecosystem, considering the actor's contribution as part of the whole.
7. Allow participants to describe the future state "as if" it already exists to describe the best-case relationships with other actors.
8. Approach each actor with respect and assumed an agent of free-choice, rather than a captive agent assigned to their role.

Following the CR approach, the collected narratives are considered against other forms of reality, including other case studies; models established from literature; and data obtained about each actor through an iterative process of explication, retroduction and empirical corroboration. Explication focuses on the description, identification, and abstraction of the composite social events under study, informed by literature and data. Retroduction is the process of hypothesising about the causal powers, mechanisms, or structures that possibly generate the social event. Empirical corroboration examines and tests the hypothetical structures and mechanisms through empirical scrutiny and compares to existing competing explanations to achieve empirical adequacy (Hu, 2018).

The collective stories and narratives are captured using an appreciative inquiry (AI) structure of questioning. AI is a strengths-based methodological approach to questioning used in change management and community development (Cooperrider et al., 2008; Whitney & Trosten-

Bloom, 2010). With the broad scope of the conversation defined based on the research questions, AI integrates with the CR and ANT perspectives through four AI stages to:

- **Current state discovery stage** to understand positive examples of the actor and their relationship with the innovation hub;
- **Future state dream stage** to identify the best possible future outcomes in relation to their relationship with the innovation hub;
- **Co-creating design stage** to understand the interviewee's ideas on what could make the future state a reality; and
- **Delivery of action plans** in terms of research outcomes.

Models and instruments of innovation ecosystems and community resilience outlined in section 2.3 inform the research and act as placeholders for data to be later tested and compared through an iterative methodology in the retrodution and corroboration stages. The approach allows the research to develop from a basis of what can be known, avoid bias from a pre-defined narrative, and corroborate and test against establishing existing models and other cases through the course of the research (Hu, 2018).

Questions are framed using an Appreciative Inquiry method to test the relationships between actors. This method aligned with Actor Network Theory to allow actors to respond and self-identify their role within a positive constructive framework. Relationships between each actor and the innovation hub were explored using open qualitative questions based on the format below. Questions were asked in conversation style, adapted to the context, and were not verbatim:

- When you consider your involvement with the [actor or role] over the past 12 months, what are some examples of good outcomes or successes? What is working well? What contributed towards the success? What was your role? What was the impact on the local community?
- Imagine it is 12 months from now. Think about your interaction with the [actor or role] and the impact of that relationship on the local community. What would be the best possible future look like? Who is involved? What are people saying about it? What are people doing? What are the outcomes? What specifically is different? What is your role in it? What would be the impact on the local community?
- If we imagine that the future has already happened, what did we do to make the future a reality? What did we put in place? Who was involved in making the change?

- Is there anything else you would like to add?

3.8 Data collection and analysis

Interviews were conducted in person, over the phone, or through computer video using the Zoom video conferencing platform. All interviews were recorded with video using a Panasonic Lumix DSLR camera and/or audio recording using a Zoom H4N audio recorder. Data was copied daily from SD cards to multiple external hard drives for backup.

Table 3-2 Example of temi.com translation errors

What was said	What was translated
“Debates about NBN”	“Debates about India”
“um, delivering support”	“I’m delivering support”
“unless you have some other way of doing that”	“unless you have some other wife for doing that”
“Is there agreement that there... we should try”	“Is there agreement that they should try”
“the organisation that I worked at”	“the oldest person that I worked at”
“to try things”	“to trial things”

The data was then coded to see what the qualitative data it yielded before putting the data back together in a meaningful way (Creswell, 2015, p. 156), applying “labels that assign symbolic meaning to the descriptive or inferential information compiled during a study” (Miles, Huberman, & Saldaña 2014, p. 71). The interviews were structured with the stages of appreciative inquiry, and interview data was reviewed with each of the three research questions in mind (Elliot, 2018).

Coding was initially attempted using NVIVO. A dedicated tool was later created using Microsoft Access to capture the multiple levels of protocol and structural coding methods and subsequent analysis. For each open code in the interview, coding identified the role and actor of the interviewee, the role and actor being described, the role and actor being acted upon, and the second-order code of indicators of community resilience, vision, and strategy. This depiction is outlined in Figure 3-3.

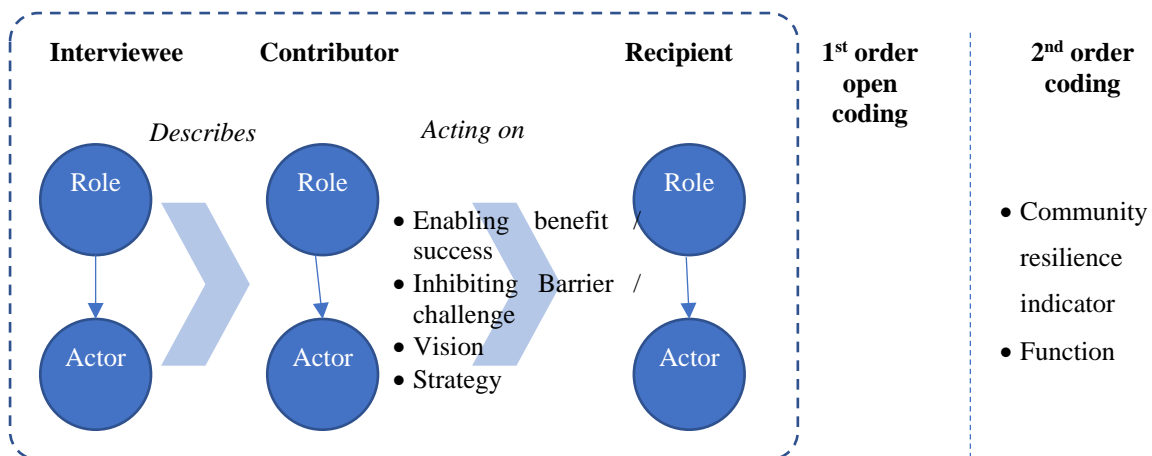


Figure 3-3 Interview actor / role conceptualisation

Several approaches are available for coding, depending on the research design. A research project will use multiple approaches depending on the method and objectives. Table 3-11 below outlines the approaches used in this research based on the options listed in Saldana's Coding Manual for Qualitative Researchers (2009).

Table 3-3 Coding options applied for qualitative research

Method	Category	Description	Used?	Application
Grammatical Methods	Attribute Coding	Notation of basic descriptive information.	Yes	<ul style="list-style-type: none"> • Interview region • Interviewee gender
	Magnitude Coding	A supplemental alphanumeric or symbolic code or subcode added to an existing coded datum or category.	No	
	Simultaneous Coding	The application of two or more different codes to a single qualitative datum.	Yes	<ul style="list-style-type: none"> • Code data as actor and role acting on actor and role. • Apply open codes. • Designate as strategy, vision, benefit, or barrier.
Elemental Methods	Structural Coding	Applies a content-based or conceptual phrase representing a topic of inquiry to a segment of data that relates to a specific research question used to frame the interview.	Yes	<ul style="list-style-type: none"> • Apply open code statements to large chunks of interview data related to the four broad types of benefit, barrier, vision, or strategy.
	Descriptive Coding	Summarises in a word or short phrase – most often as a noun – the basic topic of a passage of qualitative data.	Yes	<ul style="list-style-type: none"> • Designation of content as one of four types: Benefit, barrier, Vision, or Strategy.
	In Vivo Coding	A word or short phrase from the actual language found in the qualitative data record “the terms used by [participants] themselves”.	Yes	<ul style="list-style-type: none"> • Open codes incorporated language from the participants, eg., “Greater involvement, turned into 9 to 5” or “not having the personal bandwidth”
	Process Coding	Uses gerunds (“-ing” words) exclusively to connote action in the data.	No	
	Initial (Open) Coding	Breaking down qualitative data into discrete parts, closely examining them, and comparing them for similarities and differences.	Yes	<ul style="list-style-type: none"> • Initial open coding of data with statements for chunks of interview data
Affective Methods	Emotion Coding	Label the emotions recalled and/or experienced	No	
	Values Coding	The application of codes onto qualitative data that reflect a participant’s values, attitudes, and beliefs	No	
	Versus Coding	Identify in binary terms the individuals, groups, social systems, organizations, phenomena, processes, concepts, etc. in direct conflict with each other	No	
	Evaluation Coding	The application of non-quantitative codes onto qualitative data that assign judgments about the merit and worth of programs or policy.	Yes	<ul style="list-style-type: none"> • The assignment of benefit and barrier of other actors is a form of evaluation.
Literary and Language Methods	Dramaturgical Coding	Apply the terms and conventions of character, play script, and production analysis onto qualitative data.	No	

Method	Category	Description	Used?	Application
	Motif Coding	The application onto qualitative data of previously developed or original index codes used to classify types and elements of folk tales, myths, and legends	No	
	Narrative Coding	Applies the conventions of (primarily) literary elements and analysis onto qualitative texts.	No	
	Verbal Exchange Coding	The verbatim transcript analysis and interpretation.	No	
Exploratory Methods	Holistic Coding	An attempt “to grasp basic themes or issues in the data by absorbing them as a whole.	Yes	<ul style="list-style-type: none"> • Apply open code statements to large chunks of interview data.
	Provisional Coding	Establishes a predetermined “‘start list’ set of codes prior to fieldwork”.	Yes	<ul style="list-style-type: none"> • Indicators of community resilience and roles in the innovation ecosystem developed prior to fieldwork
	Hypothesis Coding	The application of a researcher-generated predetermined list of codes onto qualitative data specifically to assess a researcher-generated hypothesis.	No	
Procedural Methods	OCM (Outline of Cultural Materials) Coding	An index that provides coding for the categories of social life	No	
	Protocol Coding	The collection and coding of qualitative data according to a pre-established, recommended, standardized, or prescribed system.	Yes	<ul style="list-style-type: none"> • Indicators of community resilience applied to each open code
	Domain and Taxonomic Coding	An ethnographic method for discovering the cultural knowledge people use to organize their behaviours and interpret their experiences	No	

A process flow of the methods of coding is outlined in Figure 3-4. Data was first designated by attribute of region and gender. Simultaneous coding was then used to apply a designation of benefit, barrier, vision, or strategy as both evaluation and descriptive. An open code was applied that was structural in that it fits into one of the four categories of benefit, barrier, vision, or strategy as well as using in vivo language from the participants.

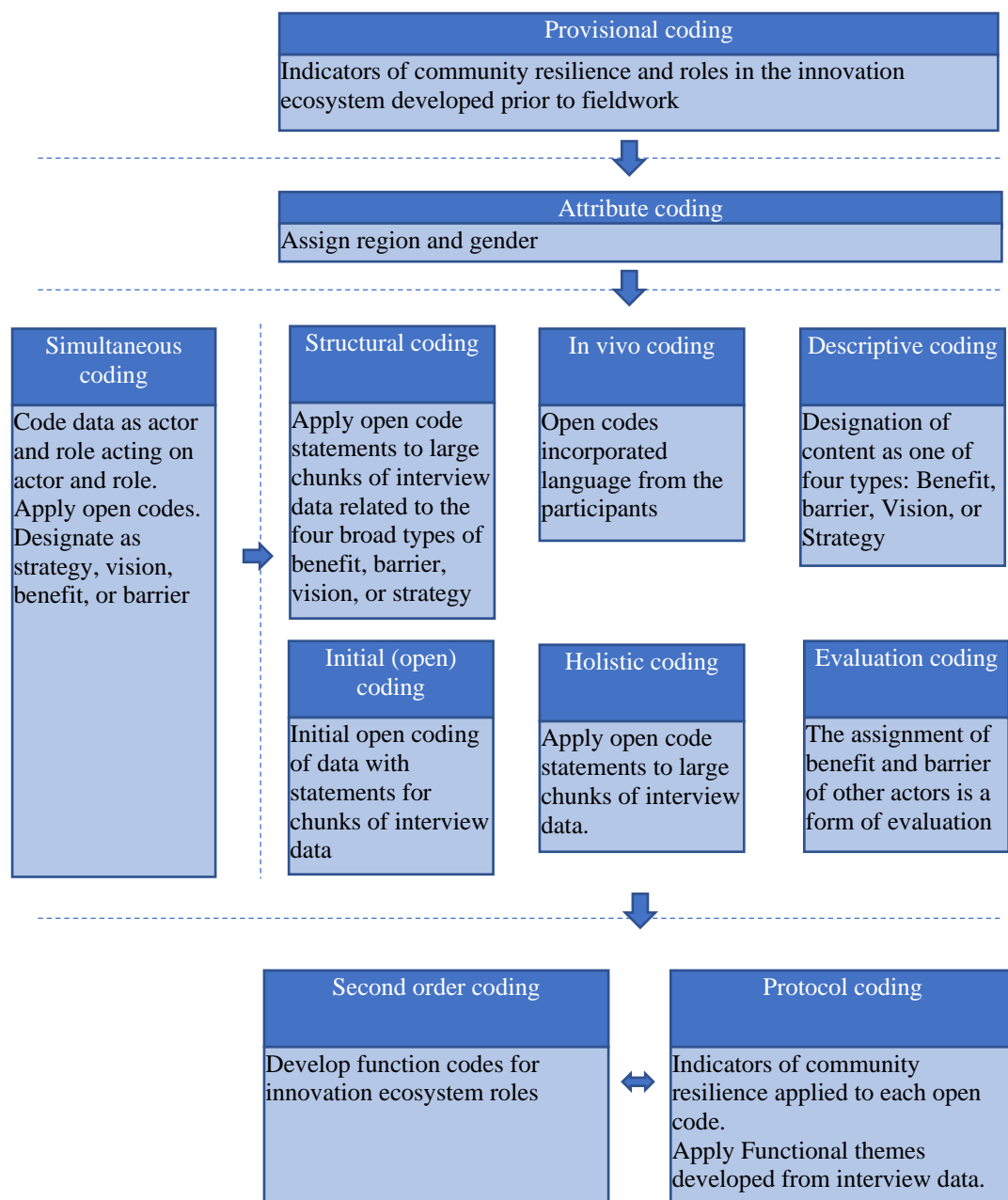


Figure 3-4 Coding process

There is a risk of assigning roles and actors to people, as it can cast them with static labels that represent only a small part of who they are (Charmez, 2006). The coding applied the ‘role’ and ‘actor’ as described by the interviewee as an initial structural coding technique (MacQueen et al., 2008; Namey et al., 2008; Saldana, 2009). Multiple roles and actors could be described in a single statement resulting in simultaneous coding where “two or more codes applied to the same passage or sequential passages of text” (Miles & Huberman, 1994; Saldana, 2009, p. 62). For example, an individual may be described in their capacity as representing an innovation

hub, as a mentor, and as an ecosystem leader. In these instances, the statement was coded multiple times to allow different codes to emerge for the different identities.

Sections of full interview text were copied into a Microsoft Access tooling form, applying both lumping (coding a large excerpt of data) and splitting (creating smaller codable moments of data) approaches (Saldana, 2016). Holistic and structural coding was applied with an initial open code to capture the observation from the paragraph and a “type” of code based on whether the interviewee was describing a benefit, barrier, strategy, or vision.

Statements were created to summarise what was being described by the interviewee about the interaction. This initial open coding process involved comparing data with data; staying close to and remain open to exploring what was interpreted was happening in the data; constructing and keeping codes short, simple, precise and active; and moving quickly but carefully through the data (Charmaz, 2006; Thornberg & Charmez, 2013). No attempt was made to consolidate or group codes at this stage.

The four descriptive code types of benefit, barrier, strategy, or vision tended to align with the appreciative inquiry interview format. In sections of the interview focused on benefit as part of the appreciative inquiry questioning, the interviewee may describe a barrier for comparison. Similarly, new barriers and strengths may come up as the interviewee described their vision and strategy. The appreciative inquiry questioning structure was beneficial to group the four descriptive code types and ensured each AI stage was addressed in each interview. The input form of the Microsoft Access tool is shown in Figure 3-5.

Coding From To

Source	From (Role/Actor)	To (Role/Actor)	Code type	Open Code	Detail	
Chamber of Commerce - Ipswich	Innovation hub Fire Station 101	Entrepreneurs	Benefit / Success	Sense of community, belonging	[Cha] could have been two models operating the council, which has station station. Yep. Certainly the cons of fire station 101. One is, is that apparent attachment to the bricks and mortar with, within, within fire station. Um, uh, it's, it's variously become more about the asset and the, and the building than it has been about the culture and the, and the ecosystem. Um, little	Code From To Code: 11 Function: 3 Vision: 0
Chamber of Commerce - Ipswich	Geographic region Ipswich	Chamber of Commerce Chamber of Commerce - Ipswich	Benefit / Success	Focus are aof food and agriculture	[Chad] So a small business. It's a good question. So what fan is, is in fact a, a replica of the, of the chamber value proposition, which is, which is bespoke and it's bespoke in the sense that it is designed to appeal, solely in discreetly to food growers and food hospitality providers, food tourism operators. So, um, it's a, it's a unique range of service offerings that are, um,	Code From To Code: 7 Function: 2 Vision: 0
Chamber of Commerce - Ipswich	Innovation hub Fire Station 101	Established business	Vision	Hub focus more on established businesses	[Chad] that best possible future hubs in the region. So my preference for what the future might look like in that space chad is that, um, is that far from being a separate entity from a chamber of commerce or. So it doesn't have to be a chamber compared some other. member base culture or community. an innovation hub actually reaches out to largely to existing business to either.	Code From To Code: 3 Function: 0 Vision: 3

Figure 3-5 Microsoft Access tool coding input form

Codes designated as a benefit or barrier were protocol coded as relating to a list of 73 a priori indicators of community resilience drawn from Sharfi's aggregation work (2016) and defined in the retrodution stage of the research. The interface for assigning the community resilience indicators to the code is shown in figure 3-6.

Source

From To Relationship Benefit / Success

Indicator

1. Infrastructure 2. Economic 3. Institutional 4. Social and individual 5. Strategy 6. Vision 7. Function

Efficiency

Infrastructure promotion and advocacy

Land use and urban design

Communal facilities
Land use accessibility and basic needs

Transport

Transport capacity, safety, reliability, interestedness
Transport inclusive and multi-modal networks and facilit

ICT

Internet

Robustness and redundancy

Facility multi-functionality
Location of critical infrastructure and facilities
Redundancy of critical infrastructure, facilities, and stock
Spatial distribution of critical infrastructure (measure ag;
Utility provider collaboration

More stable group of members, more end to end support

[Chad] could have been two models operating the council, which has station station. Yep.

Certainly the cons of fire station 101. One is, is that apparent attachment to the bricks and mortar with, within, within fire station. Um, uh, it's, it's variously become more about the asset and the, and the building than it has been about the culture and the, and the ecosystem. Um, little Tokyo 2, um, I think the, the, the pros in that space has been, um, from what I understand, it's been extremely flexible in the way that it initiates contact from innovators and people can, saving a new new ideas of, oh, I don't know the statistics on it, Chad, but I wouldn't mind betting that that little Tokyo to probably has a higher level of turnover of members and clients. Then fire station one on one that has a much more stable group of members and, and um, and, and clients who are remaining to, to probably end to end formulate their ideas.

Um, I'm not necessarily saying that that's an advantage or a disadvantage to my mind they're very different models and that's partly a function of the fact that one is very tied to the asset I'm being tied to. The asset though is not, is not entirely a bad thing. And that in it, I think it goes right to the heart of what a hub is intended to be. And that is that people want a sense of community. They want to belong to something, whether it's fire station 101, where they have the opportunity to sit down and a recognized familiar space and be creative. among their peers or whether it's little Tokyo 2 where they come, they seem to come together briefly

Code

- Collaboration: Knowledge and information transfer
- Community bonds, social support, and social institutions: Boundary spanning (local)
- Dynamism: Business cooperation (local)
- Dynamism: Economic diversity
- Dynamism: Entrepreneurialism openness
- Dynamism: Locally-owned business
- Education and training: Capacity building and enhancing awareness
- Function: Coaching
- Function: Counselling
- Function: Mentor
- Leadership and participation: Strong leadership
- Management of resources: Personnel - skilled
- R&D: Innovation and technology update
- Security: Economic stability

Figure 3-6 Interface in Microsoft Access tool for assigning 2nd-level coding to initial open codes

The total number of codes were counted and analysis provided as percentages enabling versus inhibiting factors only to demonstrate a systematic approach to the qualitative research and a useful indicator for the importance of a given code (Elliot, 2018). The pertinent information for the research is in the presence of the indicator and sentiment and narrative shared in the interviews, not the quantitative orientation of magnitude and frequency (Creswell, 2013). Given the significant scope, scale, and diversity of the research interviews, the number of codes could be influenced by variables related to the research method like sample selection and interview structure. As such, little emphasis is placed on the number of coding instances apart from observation to avoid suggesting findings that may be unimportant, inconsequential, and unrelated to the research topic (Saldana, 2016).

3.9 Social network analysis

Social network analysis was used to examine the nature of the network. Social network analysis is useful to examine the structure and the characteristics of a system (Crossley, 2019; Leoncini & Montresor, 2000) and is “a broad approach to sociological analysis and a set of methodological techniques that aim to describe and explore the patterns apparent in the social relationships that individuals and groups form with each other.” (Scott, 2017, p. 15). The approach was useful to describe the three types of data: composition variables or attribute data describing the characteristics of the actor, structural variables or relational data describing the relational tie between actors, and ideational data which describe “the meanings, motives, definitions, and typifications involved in actions” (Scott, 2017, p. 17).

Combined with ANT, social network analysis provides insights on the relationships discovered by introducing an awareness of the overall network beyond the perspective of the individual actor (Scott, 2017; Vicsek et al., 2016). Like ANT, social network analysis acknowledges that the impact on a system is as much inherent to the relationship as it is the characteristics of the individual actors (Pfefferbaum et al., 2017; Knoke & Yang, 2008). To visualise the social network, the software platform Gephi was used to display network graphs based on input from two files: a node file and an edge file. The two files were created from the data exported from the Microsoft Access tool described in Section 3.8.

Different node files were created with nodes designated as individual actors, roles, community resilience indicators, and functions. Each node could have additional attributes such as gender, role, or relationship type (enabler or inhibitor) which were used to designate as a colour and/or physically group nodes together. Edge files were created that included relationships between

nodes. These relationships included the description of one actor interacting with another actor, the relationship of an actor performing a function, and an actor contributing towards an indicator or dimension of community resilience. Additional edge attributes included the relationship type (enabler, inhibitor, vision, strategy) or the acting node role. These attributes were used to colour the edges for visualisation and analysis.

Nodes were manually positioned on the graph in proximity to each other based on common attributes, such as role or relationship type. Nodes were also positioned to minimise edges crossing over each other to minimise confusion where possible. Node sizes were based on density, with larger nodes represented by an increased number of relationships with different nodes (Crossley, 2019).

Four different social network graphs are provided in this thesis. First, actors and roles are represented as nodes, coloured and grouped by roles. An example is represented in Figure 5-3 and copied in Figure 3-7 below to convey the density of roles identified in this research. The graph is not useful to convey the nature of the relationship between individual roles, but it does provide a sense of the complexity inherent to the number of connections between roles.

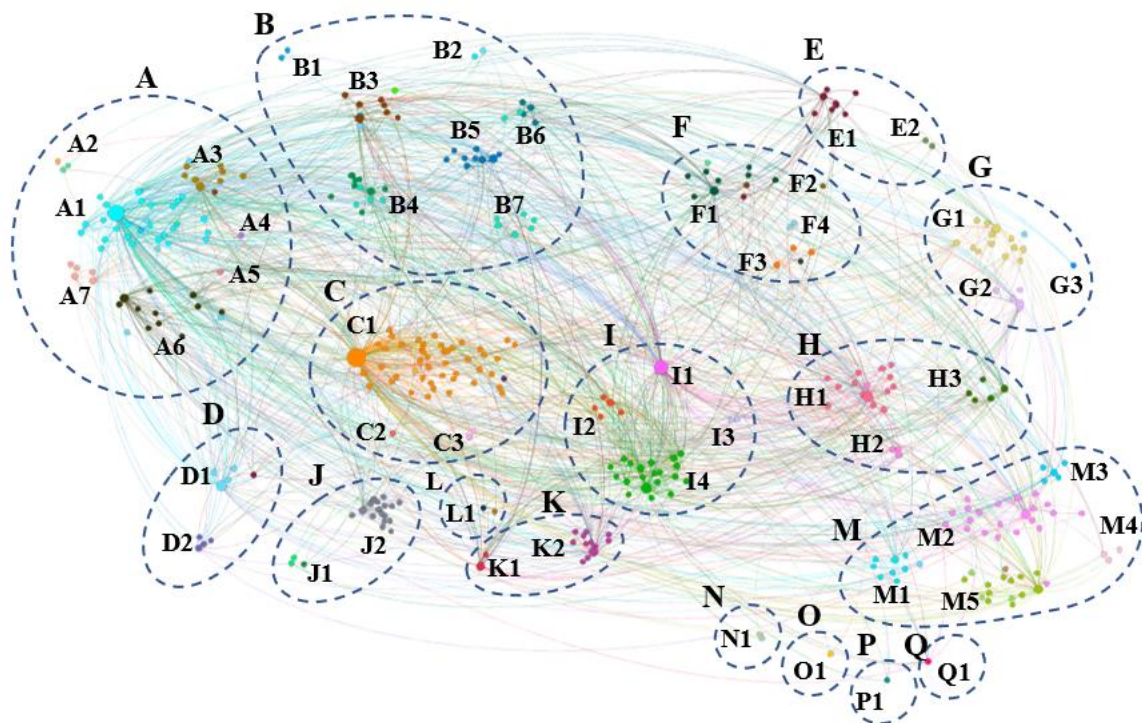


Figure 3-7 Social Network graph with actors and roles represented as nodes, coloured and grouped by roles

A second type of social network graph depicts roles and functions as nodes, coloured and grouped by function type in relation to the innovation hub. An example of this type of graph is shown in Figure 5-6 and a sample provided in Figure 3-8 below. This graph is valuable to show the dominance of functions performed by roles as well as the limited roles performing other functions, although the graph is less useful in identifying which specific roles provide each function.

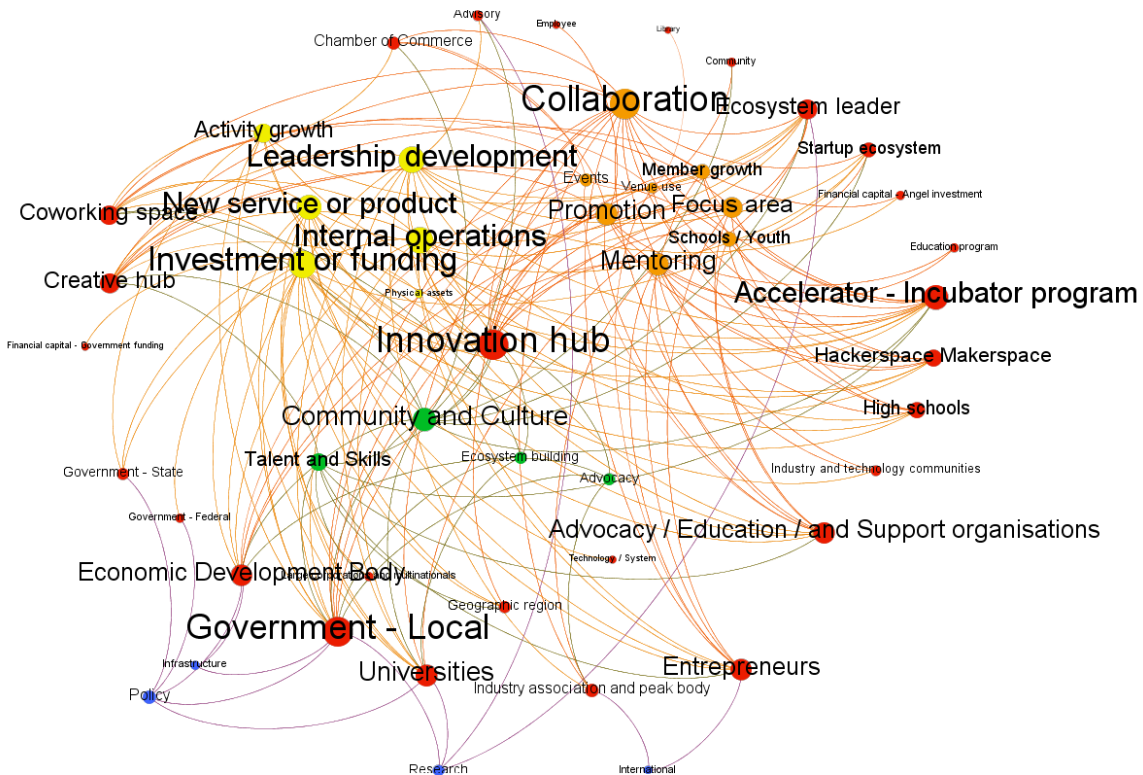


Figure 3-8 Social Network graph with roles and functions as nodes, coloured and grouped by function type in relation to the innovation hub

A third social network graph depicts roles as nodes and edged coloured by relationship type (enabling or inhibiting) for a given community resilience dimension. These graphs are used in Chapter 6 for each subdimension of community resilience as shown in the example in Figure 3-9. These graphs are helpful to display which roles were identified as contributing towards the community resilience subdimension, the number of times the contribution was referenced depicted by the size of the role node, and the nature of the relationship between each role as enabling or inhibiting. Clarity and usefulness begins to diminish for graphs with a greater number of edges such as the subdimension of Collaboration where most roles have both an enabling and inhibiting contribution with most other roles.

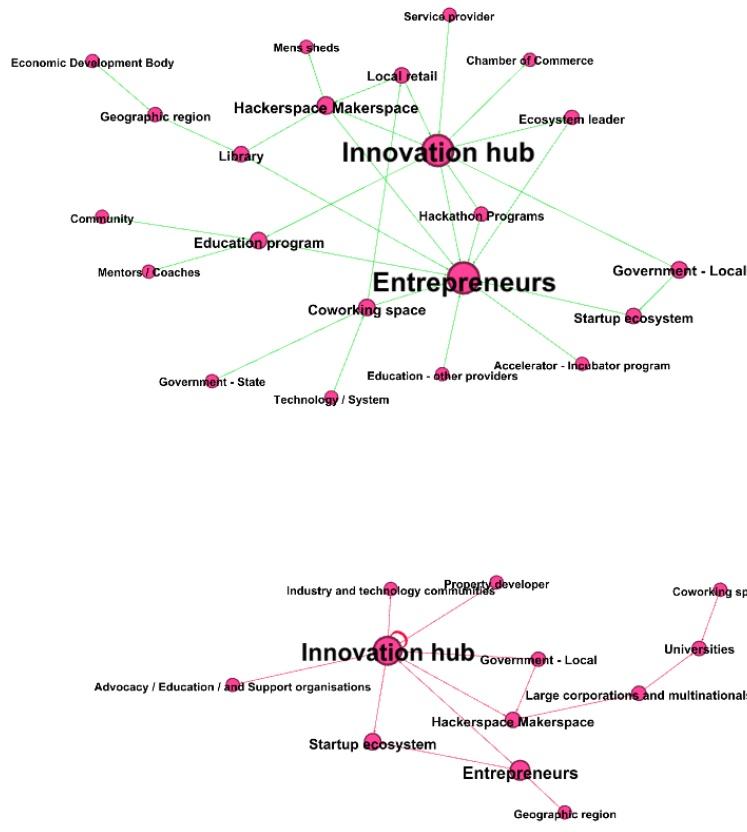


Figure 3-9 Social Network graph with nodes and edges coloured by relationship type (enabling or inhibiting) for a given community resilience dimension

Fourth, social network graphs are provided to show roles and community resilience indicators as nodes, node colour by community resilience dimension and edge colour by relationship type (enabling or inhibiting). Two examples are provided in Chapter 7: the innovation hub relationship to other roles through the contribution towards subdimensions of community resilience (example in Figure 3-10); and the innovation hub relationship to other roles through the contribution towards indicators of community resilience (example in Figure 3-11). These graphs are visually engaging and useful in showing density of contribution towards indicators and subdimensions, but otherwise are limited in any level of detail. The map at the indicator levels is at such a level of detail that makes any further insights difficult without supporting data tables.

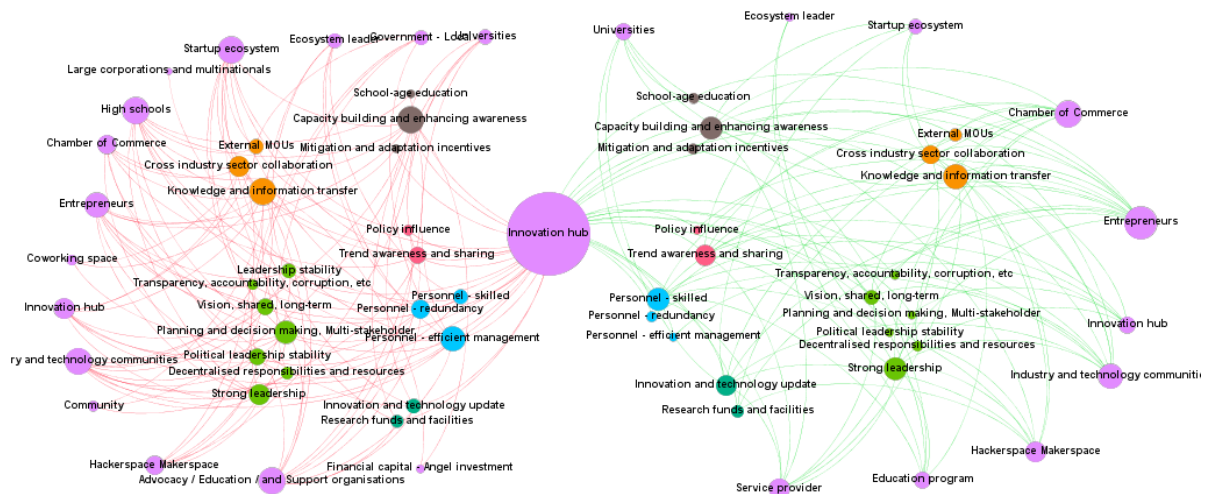


Figure 3-10 Social network graph with roles and community resilience subdimensions as nodes, node colour by community resilience dimension and edge colour by relationship type (enabling or inhibiting)

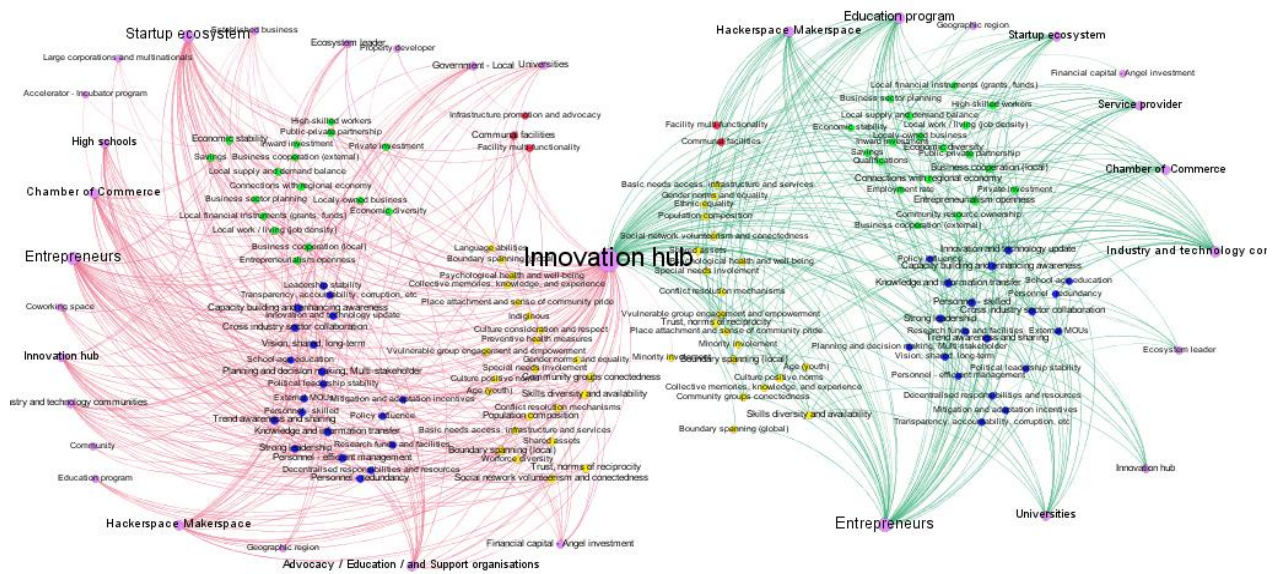


Figure 3-11 Social network graph with roles and community resilience indicators as nodes, node colour by community resilience dimension and edge colour by relationship type (enabling or inhibiting)

Finally, social network analysis is used in Chapter 8 to explain roles in the innovation ecosystem identified in literature compared to roles identified in this research (Figure 8-1) and a summary of groups of functions by role type in the innovation ecosystem (Figure 8-2). In each case, the information could be and is often supported with tabular data. The social network analysis assisted the researcher and the reader to visualise and understand at a glance the extent and nature of relationships between actors and contributions in the system.

3.10 Reliability and validity

The coding process described in section 3.8 was tested with multiple coders for intercoder reliability to “to assess the rigour and transparency of the coding frame and its application to

the data” (O’Connor & Joffe, 2020, p. 1). The use of multiple coders was “not to necessarily imply there is a single true meaning inherent in the data [but to] show that a group of researchers working within a common conceptual framework can reach a consensual interpretation of the data” (O’Connor & Joffe, 2020, p. 5). Two additional independent coders were used to assess a 10 per cent sample of data representative of roles, regions, and stage of the appreciative inquiry questioning (current state, future state, strategy). Each coder was provided a 30-minute briefing on the process, the Microsoft Access tool, and the list of community resilience indicators. No stipulation was provided for the number of codes, allowing for each coder to follow the same process as the original coder.

The research team was provided with 34 blocks of interview text to code. Each team member reviewed the text to perform protocol coding and assign community resilience indicators. The total number of indicator codes varied by 2 per cent – between a total of 180 and 184 indicator codes from each coder. Each code represented a community resilience dimension, subdimension, and indicator. The team coded 77 per cent of the text blocks with the same dimension, 58 per cent of the blocks with the same subdimension, and 33 per cent of the blocks with the same indicator. These variances were deemed acceptable given the different perspectives and disciplines of the coders (Elliot, 2018). It would be expected that the alignment would come closer to the recommended 85 per cent to 90 per cent as coders became more familiar with the text, indicators, and concepts (Elliot, 2018; Miles, Huberman & Saldana, 2020).

3.11 Conclusion

Chapter 3 described the methodology for the research. Critical realism provides both the philosophical approach as well as the structure of explication, retrodution, and empirical corroboration to describe how the research was conducted. The explication outcomes of the Queensland innovation ecosystem, community resilience indicators, and incubator taxonomies were provided. These provided inputs into the qualitative interview process of structured questions around the appreciative inquiry approach. The elite leader and snowball sample selection process was described, including an understanding of the nature of the 147 interviewees. The data collection and analysis section outlined the approach to coding the data and development of a custom tool to map benefits, barriers, vision, and strategy as well as community resilience indicators and innovation ecosystem role functions. Chapter 4 includes data and analysis gathered about the innovation ecosystem, innovation hubs, and community resilience from the retrodution stage of the research. The results chapters detail the outcomes

arising from the implementation of the methodology described in this chapter, with Chapter 5 focusing on the role of the innovation hub within the innovation ecosystem and Chapter 6 focusing on the contribution of both the innovation ecosystem and the innovation hub towards community resilience.

CHAPTER 4: OBSERVATIONS OF THE INNOVATION ECOSYSTEM, COMMUNITY RESILIENCE, AND INNOVATION HUBS

4.1 Introduction

This research set out to answer three questions outlined in Sections 1.4 and 3.2. These questions relate to the role of the innovation hub in the innovation ecosystem and their contribution to community resilience. Chapter 2 provides an understanding from literature about each of the three constructs of the innovation ecosystem, community resilience, and innovation hubs. Chapter 3 outlined the method, focusing on the use of critical realism as a philosophical position and research design and describing the three iterative stages of explication, retrodution, and empirical corroboration to understand reality.

Chapter 4 applies what can be known from literature and empirically observed in Australia to outline the coding framework employed in the research. Section 4.2 provides the matrix of roles and actors observed in the Australian innovation ecosystem, Section 4.3 draws on literature to list dimensions subdimensions, and indicators of community resilience. Section 4.4 presents a taxonomy of incubators from literature to position the focus role of the innovation hub. Section 4.5 uses the information from the previous three sections to present a hypothesis of the contribution of the innovation ecosystem and the innovation hub on community resilience. The aim of Chapter 4 is to provide a bridge between literature and observation on the one hand, and the results of the interviews as part of the empirical corroboration stage described for each of the three constructs in Chapters 5, 6, and 7.

4.2 Roles in the Australian innovation ecosystem and growth of the Queensland innovation ecosystem

Innovation ecosystem models were reviewed to develop a starting matrix of roles, actors, and indicators. These were used to identify interviewees by their roles in the ecosystem, including schools, universities, government, chamber, entrepreneurs, investor groups (angels), and innovation hubs or spaces. A list of models and described roles are considered in-depth in Chapter 8 (including those from OECD/Eurostat, 2018; EC et al., 2013; Carlsson & Stankiewicz, 1991; Van de Ven, 1993; Isenberg, 2011; Szerb et al. 2013; Aspen Network of Entrepreneur Development, 2013; Global Entrepreneurship Research Association, 2018).

Consolidating the roles proved difficult due to cross-over between functions and roles and a lack of common terminology. Models can present a taxonomy that is overly detailed with a large number of categories, or reductionist with a lack of specificity increasing the likelihood of misapplication (Brown & Mason, 2017). The list of roles from a sample of models is discussed further in Chapter 8. A summary of roles is provided in Table 4-1 of indicative roles in an innovation ecosystem.

Table 4-1 Consolidation of innovation ecosystem roles from existing models

Role	Other terms used
Capital	Finance, Investor networks, Grants and incentives, Venture capital
Community	Civil society, Community centres
Community development	Sustainable development / green jobs, Quality of life
Culture	Culture, Framework conditions (history of the innovation system in action)
Entrepreneurs	Founders, Entrepreneurs, Startups
Government	Government, Policy
Infrastructure	Digital infrastructure, Real Estate Industrial use, Upgraded office spaces, Coworking spaces
International	International consuls, External connections, International partners
Leaders	Keystone individuals, Keystone institutions, Leaders and Feeders, Large companies, Mature corporation
Markets	Macroeconomic conditions
Programs	Incubators, Accelerator programs, Hackathons, Hubs, Makerspaces, Meetups, Master class sessions, Pitch-fests, Programs (Business attraction and marketing, Business retention and expansion), Mentors
Research	Networks (Communities of practice, Joint research arrangements, industry-research collaboration, public procurement of private sector outputs), R&D / Innovation, Universities, Technology and innovation, Industrial research centres
Service providers	Service providers, Professional Organisation, Support / services / connections, Professional support, Tax specialists, Logistics and distribution centres
Talent	Human capital, Specialised labour pool, Management

The list of roles in Table 4-1 was initially informed by literature, with additional roles being identified through an interactive process of observing the Australian innovation ecosystem. The first iteration of the study focused on forms of incubators in the state of Queensland. A taxonomy was created based on the role of the space or program (e.g., coworking, innovation hub, accelerator program) and primary funding role (e.g., corporate, venture capital,

independent/mixed, university, government). Data was collected through internet searches, collated on a graphic in PowerPoint, and published via social networks including LinkedIn. A total of 93 actors were posted across the three roles. The post received 361 likes, 66 comments, and 69 shares (Renando, 2017a). The map was updated over several weeks based on feedback about missing or misidentified roles. The map is displayed in Figure 4-1.

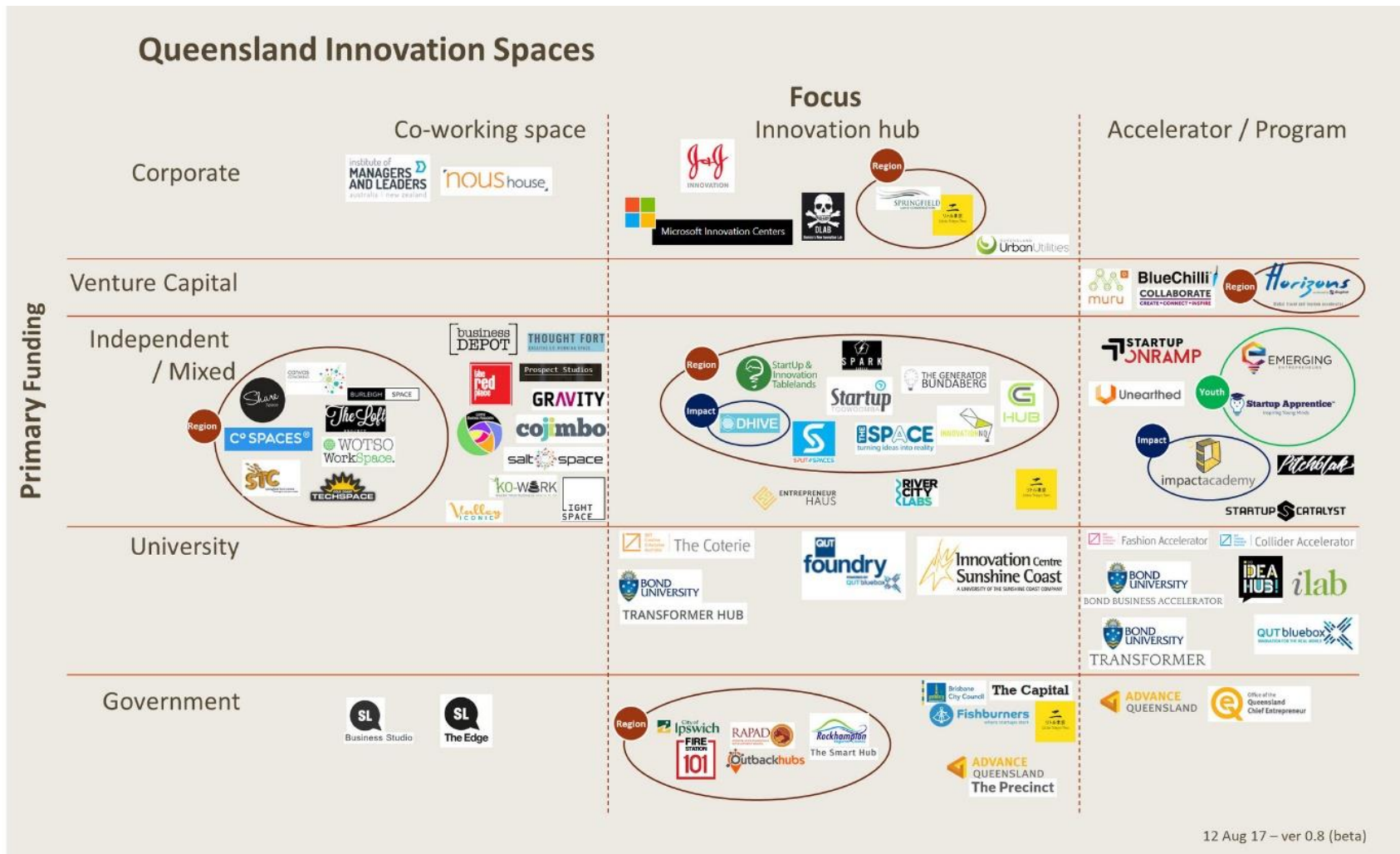


Figure 4-1 A map of Queensland's accelerators, innovation hubs, and co-working spaces

The second iteration of the innovation ecosystem map expanded the roles and increased the geographic scope to include the rest of Australia. Data was again collected through internet searches and personal relationships. The Google Maps platform was used to collect and present the data. The results were also published via social networks. A total of 593 actors were presented across six roles. The post received 711 likes, 108 comments, and 102 shares (Renando, 2017b). The map is shown in Figure 4-2.

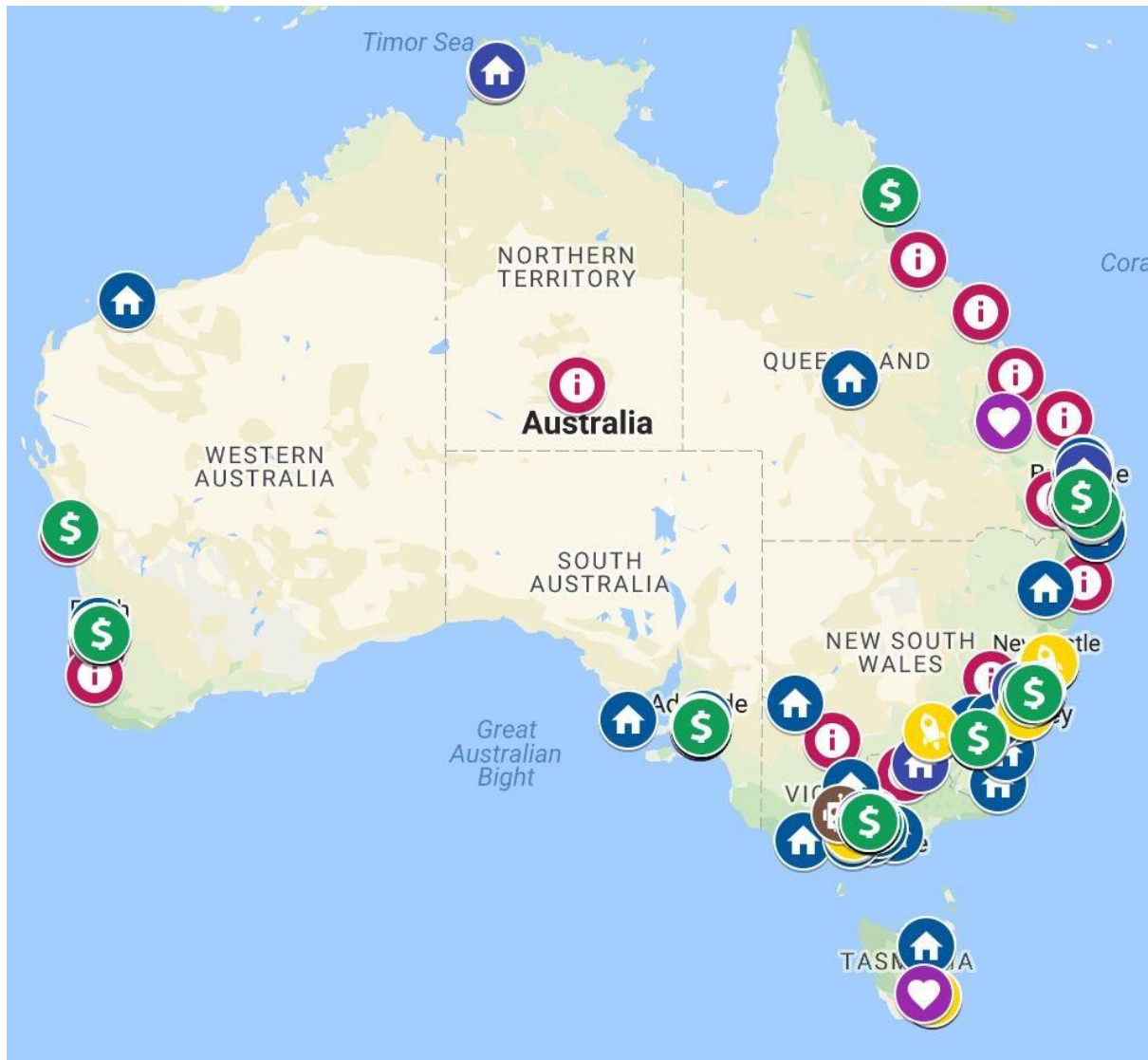


Figure 4-2 A map of the Australian Innovation Ecosystem, second iteration on Google Maps

The third iteration of the innovation ecosystem map increased the number of roles to twenty, expanded the number of actors to over 2,200, and moved the data to a dedicated digital platform. Data was collected through internet searches as well as allowing actors to self-nominate. The results were once again published via social networks. The LinkedIn post

received 354 likes, 56 comments, and 37 shares (Renando, 2018). A screenshot of data from the platform in the is shown in Figure 4-3.

A map of organisations supporting entrepreneurs in Australia. Background information can be found [here](#).

To add or update an entry, please complete the form at <https://startupstatus.co/map-feedback/>

Filters Copy current view Clear all filters

Search by keywords

Models

- Venture Capital
- University
- Corporate
- Primary school / High school
- Government
- Independent
- LGA - Local Government Authority

Categories

Technology

- Advanced Manufacturing, 3D printing
- Artificial Intelligence
- Blockchain
- Consumer Electronics
- Cryptocurrency
- Drones
- Energy storage
- Food manufacturing
- Internet of Things (IoT)
- Property tech
- Robotics
- SportsTech
- AgTech
- Biotechnology
- Clean Energy
- Creative Tech
- EdTech
- Fintech
- Hardware
- Material technology
- Renewable Energy
- SpaceTech
- VR/AR

Impact

- Affordable and clean energy
- Circular Economy
- Community or civic cohesion
- Disabilities
- Education
- Environment
- Females
- Gender equality
- Homeless
- LGBT+
- Multi-cultural services
- Poverty
- Refugees
- Social Enterprise
- Youth
- Charitable giving
- Clean water and sanitation
- Corporate and government ethics and CSR
- Disaster response and relief
- Employment
- Environmental sustainability
- Food security
- Health and well-being
- Indigenous
- Mental Health
- Older generation
- Prisons
- Rural and regional
- Social impact measurement

Mapping

- Aerospace
- Automotive
- Agriculture and Food
- Cannabis

State: All Australia Region: All Hide National

INNOVATION HUB / INCUBATOR HUB

Physical or virtual space with dedicated resources (programs, mentors, capital) to support entrepreneurs

AU National

AUSTRALIA

- INNOVATION HUB ABC Innovation Hub

Australian Capital Territory

CANBERRA

- in Canberra Innovation Network
- CEAT Innovation Hub Centre for Entrepreneurial Agri-technology
- E29 Entry 29 Canberra
- E29 Entry 29 GUC
- GAME PLUS Game Plus Canberra

New South Wales

ARNDHILL

- lne University of New England
- SRL
- lne DJIART Region Incubator
- lne Smart Farm Innovation Centre
- Upstairs Upstairs Incubator
- bec BEC BaySide BEC
- the business centre Business Innovation Centre

Coffs Harbour

- degrees 6 Degrees Coffs Harbour
- degrees 6 Degrees Wollongong
- the business centre Business Innovation Centre
- the business centre Business Innovation Centre

MID-COAST

- the business centre Business Innovation Centre
- the business centre Business Innovation Centre

MUSWELLBROOK

- 12N Integrated Innovation Network University of Newcastle's Integrated Innovation Network (I2N)

NEWCASTLE

- DOSH
- 12N Integrated Innovation Network
- 12N Integrated Innovation Network
- GATE

ORANGE

- the business centre Business Innovation Centre
- PARAHAMPTA

SCHOOL ENTREPRENEUR / STEAM PROGRAM

Programs to develop STEAM and entrepreneurial skills in young people in or through schools

AU National

AUSTRALIA

- ENTERPRISING GIRLS Academy for Empowering Girls
- Code Club Australia
- EduTech Educach Australia
- StarPortal
- ABCN Australian Business Community Network (ABCN)
- ALPHEA Young Entrepreneurs Scheme (YES)
- \$20 BOSS \$20 Boss program
- ABW ABW Enterprise Education
- Australian School of Entrepreneurship
- BECOME BECOME Educator
- Beacon Foundation Beacon Foundation
- BEERAS BEERAS BEERAS Bebras Australia Computational Thinking Challenge
- CSIRO CSIRO Virtual Work Experience Program
- Digital Schools Networks
- Code Camp
- Code Like a Girl Code Like a Girl
- Coder Kids
- CoderDojo CoderDojo
- Creable
- CSIRO Creativity in Research Engineering, Science and Technology (CREST)
- DISCOVER DAIRY PROGRAMS Discover Dairy
- Education Services Australia Education Services Australia
- EMERGING Emerging Entrepreneurs
- Enterprise and STEM
- Day of STEM
- FIFTYSIX FiftySix Creations
- Future Anything
- Future Problem Solving Australia
- THE GLOBE PROGRAM
- Grandshake

RESEARCH

Organisation focused on research and connecting researchers to commercial opportunities

AU National

AUSTRALIA

- ASPI AUSTRALIAN STRATEGIC POLICY INSTITUTE
- ASPI Australian Strategic Policy Institute (ASPI)
- CECF Australian Research Council (ARC) Centre of Excellence for
- CSIRO CSIRO - Low Carbon Living
- DATA 81
- CSIRO
- FUTURE FUELS CRC Future Fuels CRC

Australian Capital Territory

AUSTRALIAN CAPITAL TERRITORY

- CSIRO CSIRO - Black Mountain Site
- CSIRO CSIRO - Crace Site
- Ginnindie7ra CSIRO - Ginnindie Site
- CSIRO CSIRO - Taberlilla - Canberra Deep Space Communication Complex
- CSIRO CSIRO - Yamukata Site
- ANU ANU CLIMATE ANU Climate Change Institute
- ANU ANU Energy Change Institute
- ANU ANU Energy Change Institute
- NIGI National Centre for Indigenous Genomics (NIGI)
- ANU ANU Centre for European Studies (CES)
- ANU ANU College of Law
- ANU ANU Energy Change Institute
- Australian Centre for Indigenous History
- Australian National Centre for Latin American Studies (ANCLAS)
- SERC SERC - Space Environment Management
- SERC SERC - Space Environment Management
- Centre for Aboriginal Economic Policy Research
- Centre for Arab, Islamic Studies (CAIS)
- Centre for Mental Health Research (CMHR)
- Centre for Research on Ageing, Health & Wellbeing (CRASHW)
- Department of Global Health (DGH)
- Department of Health Services Research & Policy (DHSRP)
- Fenner School of Environment and Society
- Marras Centre for Health Policy (MCHP)
- National Centre for Epidemiology & Population Health
- National Centre for Indigenous Studies
- Research School of Earth Sciences
- Research School of Humanities & Arts
- Research School of Physics
- Research School of Physics
- Research School of Social Sciences
- School of Archaeology and Anthropology
- School of Art and Design
- School of Art and Design
- School of Art and Design
- School of Art and Design

Figure 4-3 A map of the Australian innovation ecosystem, third iteration on a dedicated platform

Each iteration of the map increased the quantity and quality of data through continued engagement with the Australian innovation community. The various roles in the ecosystem and the boundaries were socially constructed through feedback to the current iteration of over 2,700 actors across 22 roles. The process also refined the definitions of roles in the innovation ecosystem. The current output from the map database is shown in Table 4-2

Table 4-2 Indicative concentration of roles in the Australian innovation ecosystem

Roles	ACT	AU	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
Accelerator/Incubator Programs	6	8	45	1	57	13	1	45	12	188
Chamber of Commerce	1	4	4	4	40	2		4	4	63
Connections and Virtual Hubs	1	2	22		19	4	2	8	3	61
Coworking space	10	1	109	1	81	23	4	161	10	400
Economic Development Groups	1	3	16	2	23	13	1	11	9	79
Education and Support	2	21	40	4	48	17	5	24	13	174
Events / Pitch / Awards Programs	1	8	9	2	15	3	1	10	2	51
Government - Federal	1	7								8
Government - State			1	1	3	1		1		7
Hackathon Program		1	3		4	2	3	6		19
Hackerspace/Makerspace/Artspace	2		9		11	3	4	10	3	42
Industry / Technology Communities	23	5	192	3	107	32	3	130	31	526
Industry Associations and Peak Bodies	5	28	13	1	12	4	1	5	2	71
Innovation Hub / Incubator Hub	7	1	47	4	35	11	2	33	11	151
Investment	4	13	85	1	29	3		42	8	185
Media, Tools & Advocacy	2	23	2		5	2		3	2	39
Other Networking / Support Groups	5	5	56		48	15		47	18	194
Place-based research		2	1			1		1		5
Research	43	4	43	3	33	16	3	31	12	188
School Entrepreneur / STEAM Program	1	18	6		16	1		3	1	46
Science and technology parks	1		2		1	2	1	2	1	10
Universities	5		70	10	43	17	3	62	18	228
TOTAL	121	154	775	37	630	185	34	639	160	2735

The iterative mapping process above highlighted the density and nature of current roles and actors in the Australian innovation ecosystem. Information was captured for Australia based on the number of actors that operated across the states and to understand Queensland's relative position. However, the information did not reflect growth over time. A premise of this research, as noted in Section 1.2, is the rapid growth of innovation ecosystem activity. While this growth is anecdotally understood and agreed, there is little empirical evidence to highlight this growth. To address this gap and as part of the retrodution stage of the research, the establishment date was added for actors in a subset of roles in the Queensland innovation ecosystem.

The number of innovation hubs increased significantly between 2015 to 2020 from 10 to 17 in greater Brisbane and 4 to 18 hubs across the rest of Queensland. The number of coworking spaces also increased from 13 to 40 in Brisbane and 18 to 40 across the rest of Queensland. Accelerator programs increased from 9 to 31 programs in greater Brisbane and from 2 to 25 programs in the rest of Queensland. Figure 4-4 depicts this growth over time.

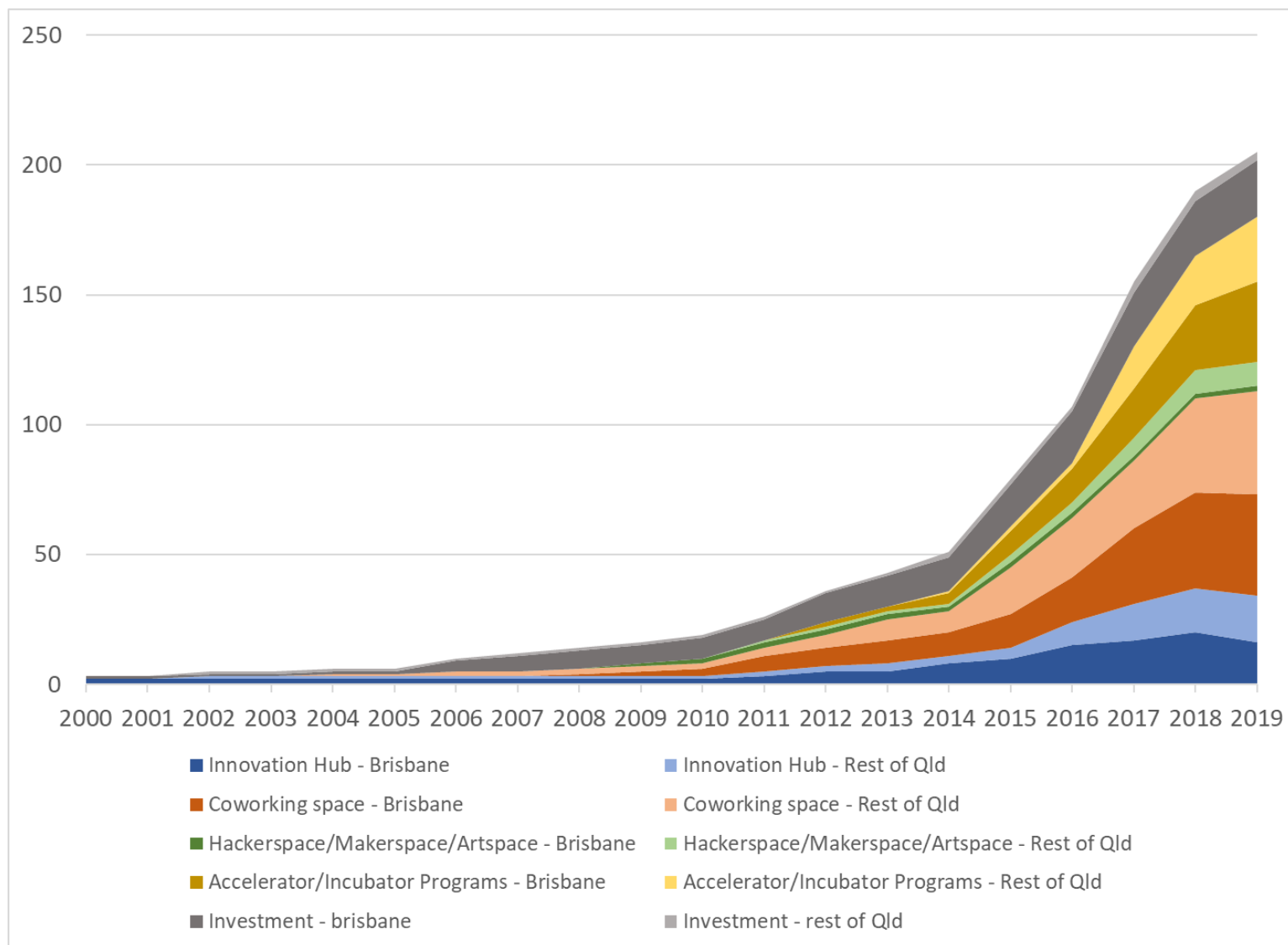


Figure 4-4 Growth in entrepreneur support organisations and functions in Queensland – 2000 to 2019, author’s research, unpublished data, 2019)

The iterative study and public feedback provided insights into the validity of innovation ecosystem roles and boundaries and provided an observable and ‘real’ reality of the Australian innovation ecosystem construct. The number of actors in Figure 4-4 and Table 4-2 is not intended to be exhaustive, as there are likely many more actors not captured in the system. The process clarified what would and would not be considered an innovation hub for the reproduction stage, which maps expected contributions of the innovation ecosystem and innovation hub on community resilience. The process also provided a framework in addition to that identified in the literature review to test the empirical reality discovered in through interviews in the empirical corroboration stage of the research.

4.3 Community resilience indicators

The varying perspectives on community resilience are simplified in four questions presented by Dinh et al. (2015) who provide a thinking framework when considering economic resilience:

- Resilience of what? (The boundaries applied to community)
- Resilience to what? (The shocks or condition experienced by the community)
- Resilience for whom (The individuals impacted by a change in resilience)
- Resilience for what (a short-term or long-term goal of resilience)

With the considerations of community resilience in mind, these questions can be subjectively answered within the context of the application of community resilience to innovation ecosystems, outlined in Table 4-3:

Table 4-3 Application of community resilience considerations for innovation ecosystems (adapted from Dinh et al. 2015)

Scoping question	Response when considering the role of innovation ecosystems on community resilience
Resilience of what? (The boundaries applied to community)	People within a permeable geographic boundary defined by legal and political parameters of a Local Government Authority Area (LGA) and social parameters of how the individual defines their “region”.
Resilience to what? (The shocks or condition experienced by the community)	Continuous social and economic pressures resulting from technology and market change.
Resilience for whom? (The individuals impacted by a change in resilience)	The individuals within the community, with an emphasis on those with current or nascent opportunity for entrepreneur activity
Resilience for what? (a short-term or long-term goal of resilience)	Long-term economic diversification as a pre-emptive condition

As described in Sections 2.3 and 2.4, innovation ecosystems, existing models, and tools provide indicators for the measurement of community resilience. These models present characteristics

of resilient communities and indicators to measure or assess community resilience. The Resource for Rural Recovery and Renewal developed by the Canadian Centre for Community Renewal (2000) outlines 57 indicators across four characteristics of people in community, organisations in community, resources in community, and community process. The 2012 Resilience Profiles Report by the Queensland Council of Social Service (QCOSS), mapped and measured 71 indicators across six domains of community resilience. These six domains considered: health and safety; economics; housing; culture; governance; and overall demographics.

A sample of models, dimensions, and variables of community resilience is outlined in Appendix 3, excluding instruments focused exclusively on natural disasters, such as the resilience performance scorecard (Burton, 2017). The number of instruments for considering community resilience is extensive. Sharfi (2016) conducted a comprehensive review of 36 systems-level tools for assessing community resilience. The initial indicators of community resilience, presented in Section 4.5, provide a reference for subsequent interviews for coding of interview data and for testing emergent themes against a reference.

4.4 Incubator taxonomies

Incubator taxonomies outlined in Chapter 2 are beneficial to demonstrate the scale of the topic but do not clearly articulate the distinguishing characteristics of an innovation hub (Aerts et al. 2007; Cooper, 1985; Barrow, 2001; Amezcua, 2013; Hackett & Dills, 2004). It is also difficult to determine a clear definition based on incubators currently in operation. A sample of incubators in Australia that could be considered as innovation hubs with the terms ‘hub’, ‘incubator’, ‘precinct’, and ‘park’ in the title are listed in Table 4-4 below.

Table 4-4 Incubators in Australia with the terms 'hub', 'incubator', 'precinct', or 'park' in the title

'Hub'	'Incubator'	'Precinct'	'Park'
Adelaide Business Hub	AgFrontier Agtech Incubator	CSIRO - Dutton Park Ecosciences Precinct	Australian Technology Park (South Eveleigh)
Agritech Hub, Charles Sturt University, Wagga Wagga	Arc Hardware Incubator	CSIRO - St Lucia, Queensland Biosciences Precinct	Ballarat Technology Park
AI Hub	Australia China Technology Incubator (ACTI)	CSIRO - Townsville, Australian Tropical Sciences and Innovation Precinct (ATSIP)	Canberra Technology Park
Artisan Hub	CareFactor Aged Care Incubator Program	Desert Knowledge Australia Precinct	Dockland Science Park
ASIC Innovation hub	FNQ Food Incubator	Gold Coast Health and Knowledge Precinct (GCHKP)	Macquarie Park Innovation District (MPID)
BizHub Maroondah	Gladstone Region Social Innovation Incubator	Startup Precinct	Tasmanian Technopark
Bridge Hub	I2N Incubator	The Precinct	Technology Park Adelaide
CEA Business Hub	Jiangsu-Victoria Innovation Center Incubator		Technology Park Bentley
Co-Hub Collaborative Hub	KILN Incubator		Thebarton (Adelaide University Research Park)
Coding and Innovation Hub	Macquarie University Incubator		
CORE Innovation Hub	MKTPlace Ventures - Start Up Incubator		
Creative Geelong Makers Hub	Regional Incubator Program		
Dantia Smart Hub (DASH)	Social Ventures Incubator Program		
Darwin Innovation Hub	The Good Incubator		
Defence and security research innovation hub	UNE SMART Region Incubator		
Defence Innovation Hub	Upstairs Incubator		
DSA-18 Hub			
Earth Systems and Climate Change (ESCC) Hub			
Engineering, Construction and Resources Innovation Hub (ECRi Hub)			
Gawler Business Innovation Hub			
GC Hub			
Hub Adelaide			
Idea Hub Social Enterprise Program			
Idea Hub Unlimited			
Innovation Hub WA			
INNX.hub			
Karma Collab Hub			
Karratha Enterprise Hub (The Business Centre Pilbara)			

'Hub'	'Incubator'	'Precinct'	'Park'
Kyneton Business Hub			
Logan Startup Hub			
MTAiQ: Motor Trade Association Queensland Innovation Hub			
Onkaparinga Youth Enterprise Hub			
Outback Hubs			
Peregian Beach Digital Hub			
Regional Australia Hub			
Renewables Innovation Hub			
Rockhampton Smart Hub			
Smart Work Hub			
sqhub			
Studio 1 Community Hub			
Sydney Business Hub			
Synergize Hub			
The Beach Hub			
The Creative Hub - Gold Coast			
The Goondiwindi Business Hub			
The Hunter Region Business Hub			
The OPENHUB			
The Production Hub			
TheHUB Wodonga			
Tyro Fintech Hub			
UTS Deep Green Biotech Hub			
White Sky Hub			
Whitsunday Climate Change Innovation Hub			
ZigZag Hub			

Determining incubator characteristics were identified based on the previous literature review and a cursory review of the incubators and their websites. Five characteristics of incubators from this process are outlined in Table 4-5, while Table 4-6 clarifies what is meant by the term innovation hub for the purpose of this research.

Table 4-5 Characteristics of incubators from a review of the Australian innovation ecosystem

Characteristic	Definition
Duration	Whether the engagement with the participant is constrained to a time or is open-ended and ongoing. Accelerator programs are unique to offer time-constrained services with a defined start and end date.
Size	Whether the operation encompasses a large real estate footprint or is in a single location or virtual. Business centres and the various parks often cover a large area with multiple locations or buildings and multiple services offerings. Innovation hubs, coworking spaces, and hackerspaces or typically constrained to one location. A single brand may franchise to multiple locations, but the nature of service does not change. Accelerator programs are delivered out of a single location or virtual through remote online delivery. Precincts can refer to a multiple location project or a single location that houses multiple brands.
Target participant	The type of participant for which the incubator is designed. Innovation hubs, precincts, accelerator programs, and science parks focus on innovation-driven entrepreneurs or high-growth potential firms. Business centres and industrial parks are generally open to any entrepreneurial business. Hackerspaces and makerspaces do not place an emphasis on entrepreneurs and focus on use of technology.
Support provided	The type of support provided to the participant, as hands-on and facilitated, or hands off and self-guided. Coworking spaces, Precincts, hackerspaces, and industrial parks may provide curation and concierge or administration services but there is often limited direct involvement with the participant's in business. Innovation hubs, accelerator programs, and research parks invest human and financial resources into being directly involved in supporting participant's businesses.
Number of brands	The number of different brands represented in the incubator. For example, an innovation hub, coworking space, makerspace, or accelerator program is often known by the single brand, although there may be multiple programs, product, or services under the same brand. By comparison, precincts, industrial parks, and research parks are likely to have multiple brands under the same incubator.

Table 4-6 Categories of incubators in the innovation ecosystem

Incubator type	Duration		Size		Target participant			Support provided		Number of brands	
	Time-based	Open-ended, Ongoing	Large, multi-site	Single location or virtual	All public	Any entrepreneur	Innovation-driven, high-growth entrepreneur	Hands-off or self-guided	Hands-on, facilitated	Multiple	Single
Innovation hub		✓		✓			✓		✓		✓
Coworking		✓		✓		✓		✓			✓
Innovation precinct		✓	✓	✓			✓	✓		✓	
Hackerspace / Makerspace		✓		✓	✓			✓			✓
Accelerator program	✓			✓			✓		✓		✓
Business centre, industrial park, business park, precinct		✓	✓			✓		✓		✓	
Research Parks, Science Parks, Technology Park		✓	✓				✓		✓	✓	

An innovation hub is unique in that it is open-ended and ongoing, is in a single location or virtual, focuses on innovation-driven entrepreneurs and high growth firms, provides hands-on support, and falls under a single brand. The observation of existing incubators provides valuable input into the subsequent stages of this research and are reviewed and adapted based on feedback from later interviews.

4.5 Innovation ecosystem contribution to community resilience indicators

The retroduction stage hypothesises about the causal powers, mechanisms, or structures that possibly generate the social event. Outcomes from the previous explication stage for each of the three constructs of the innovation ecosystem, community resilience, and the innovation hub are used as an input to provide a hypothesis of the expected contribution of the innovation ecosystem and the innovation hub to each indicator of community resilience. For each indicator, an assessment was made on the extent that the innovation ecosystem and innovation hub contributed towards the indicator of community resilience. The assessment is based on a four-point scale of none, low, medium, and high. An assessment was also made as to whether the innovation ecosystem or innovation hub would be an enabler and/or inhibitor to the community resilience indicator. The results of this process are outlined in Tables 4-7, 4-8, 4-9 and 4-19.

Table 4-7 Correlation of community resilience indicators with innovation ecosystem and innovation hub impact (environmental and social dimensions)

Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Expected innovation hub contribution	Enabler or inhibitor
Environmental	Natural assets (environment and resources)	Ecosystem monitoring and protection	None	None	NA
		Using local knowledge and native species	None	None	NA
		Erosion protection	None	None	NA
		Protection of wetlands and watersheds	None	None	NA
		Availability and accessibility of resources (air, energy, water, food, soil, etc.)	None	None	NA
		Reduction of environmental impacts (various types of pollution)	None	None	NA
		Quality of resources	None	None	NA
		Biodiversity and wildlife conservation	None	None	NA
Social	Social structure	Population composition	Moderate	Moderate	+
		Language abilities	Low	Low	+
		Car ownership, mobility	None	None	NA
		Land and home ownership	None	None	NA
		Diverse skills (to pool skills at time of disaster)	High	High	+
	Community bonds, social support, and social institutions	Degree of connectedness across community groups	High	High	+
		Volunteering and civic engagement in social networks	High	High	+
		Collective memories, knowledge, and experience	High	High	+
		Trust, norms of reciprocity	High*	High*	+/-
		Shared assets	High	Moderate	+
		Strong international civic organisations	High	High	+
		Place attachment and sense of community pride	High*	High*	+/-
		Existence of conflict resolution mechanisms	Moderate	Low	+
		Empowerment and engagement of vulnerable groups, social safety-net mechanism	High*	High*	+/-
	Safety and well-being	Crime prevention and reduction	None	None	NA
		Security services such as police	None	None	NA
		Physical health	None	None	NA
		Psychological health	Moderate*	Moderate*	+/-
		Preventive health measures	Moderate*	Moderate*	+/-
	Equity and diversity	Responsive health measures	None	None	NA
		Gender norms and equality	High*	High*	+/-
		Ethnic equality	Moderate*	Moderate*	+/-
		Involvement of minorities	Moderate*	Moderate*	+/-
		Involvement of population with special needs	Low*	Low*	+/-
		Diverse workforce in culturally diverse places	Moderate*	Moderate*	+/-
		Decency, affordability, and fair access to basic needs, infrastructure and services	Moderate	High	+
		Local culture	Past experience with disaster recovery; learning from the past	High*	High*
	Culture and historical preservation; indigenous knowledge and traditions		Moderate*	Moderate*	+/-
Considering and respecting local culture and specificities in the process	Moderate*		Moderate*	+/-	
Positive social, cultural, behavioural norms	High*		High*	+/-	

Table 4-8 Correlation of community resilience indicators with innovation ecosystem and innovation hub impact (economic dimension)

Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Expected innovation hub contribution	Enabler or inhibitor
Economic	Structure	Employment rates and opportunities	High*	High*	+/-
		Income (equality, multiple sources), poverty	High*	High*	+/-
		Age structure of working population	High*	High*	+/-
		Qualifications of working age population	Moderate*	Moderate*	+/-
		Individuals with high and multiple skills; literacy (education)	High*	High*	+/-
		Job density (housing-work proximity; extent of out-commuting)	High	High	+
	Security	Individual and community savings	High*	High*	+/-
		Collective ownership of community resources	Moderate	Moderate	+
		Business mitigation, response, and redevelopment plan	High	High	+
		Insurance (domestic and non-domestic) and social welfare	None	None	NA
		Financial instruments (Contingency funds, operating funds, capital funds, etc.)	High	Low	+
		Stability of prices and incomes	Moderate	Moderate	+
		Stability of property value	None	None	NA
	Dynamism	Inward investment	High	High	+
		Investment in green jobs and green economy (self-sufficiency, urban farming)	None	None	NA
		Connections with regional economy	High	High	+
		Business cooperation (inter)	High*	High*	+/-
		Business cooperation (Intra)	High	High	+
		Diverse economic structure and livelihood strategies	High	High	+
		Openness to micro enterprises and micro-finance services, entrepreneurialism	High	High	+
		Public-private partnership	High	Moderate	+
		Private investment	High	Moderate*	+
		Locally owned businesses and employers	High	High	+
Balance of local labour market supply and demand	High	High	+		

Table 4-9 Correlation of community resilience indicators with innovation ecosystem and innovation hub impact (built environment / infrastructure dimension)

Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Expected innovation hub contribution	Enabler or inhibitor
Built environment / Infrastructure	Robustness and redundancy	Redundancy of critical infrastructure - facilities, stocks, ecosystem	Low	Low	+
		Robustness and fortification of critical infrastructure - vital assets	None	None	NA
		Spatial distribution of critical infrastructure (measure against cascading effects)	Moderate	Moderate	+
		Location of critical infrastructure and facilities	Low	Moderate	+
		Consolidation of critical utilities	None	None	NA
		Collaboration between utility providers	Moderate	Moderate	+
		Multi-functionality of spaces and facilities	Moderate	Moderate	+
		Shelter and relief facilities and services	None	None	NA
	Efficiency	Regular monitoring, maintenance, and upgrade of critical infrastructure	None	None	NA
		Retrofit, renewal, and refurbishment of the built environment	None	None	NA
		Promotion of efficient infrastructure	Moderate	Moderate	+
	ICT	Diverse and reliable information and communication technology (ICT) networks	High	Moderate	+
		Emergency communication infrastructure (before, during, after disaster)	None	None	NA
	Transport	Capacity, safety, reliability, interestedness (connectivity) and efficiency of transportation	None	None	NA
		Inclusive and multi-modal transport networks and facilities	None	None	NA
	Land use and urban design	Accessibility of basic needs and services over time (flood, water, shelter, energy, health)	None	None	NA
		Accessibility of basic needs and services over time (education)	Low	Low	+
		Site selection and avoiding risk and habitat areas (floodplain, flood prone, exposed coastal zone)	None	None	NA
		Urban form (compact, dispersed, etc, SVF, aspect ratio)	None	None	NA
		Mixed-use development	None	None	NA
		Street connectivity	None	None	NA
		Density of development	None	None	NA
		Public spaces and communal facilities	Low	Moderate	+
		Green and blue infrastructure	None	None	NA
		Amount (per cent) of impervious surfaces	None	None	NA
		Aesthetics, visual qualities	None	None	NA
		Landscape-based passive cooling	None	None	NA
		Passive lighting	None	None	NA
		Passive heating	None	None	NA
	Passive cooling	None	None	NA	

Table 4-10 Contribution of the innovation ecosystem and innovation hub impact on Institutional community resilience indicators

Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Expected innovation hub contribution	Enabler or inhibitor
Institutional	Leadership and participation	Strong leadership	High	High	+
		Stability of leadership and political stability	High	Moderate	+
		Shared, updated, and integrated planning vision (long term)	High	Moderate	+
		Transparency, accountability, corruption, etc	High*	Moderate	+/-
		Multi-stakeholder planning and decision making	High	Moderate	+
	Management of resources	Decentralised responsibilities and resources	High	Moderate	+
		Efficient management of resources (funds, staff, etc)	High*	Low*	+/-
		Skilled emergency practitioners	None	None	NA
		Skilled personnel	High	High	+
		Population with emergency response and recover skills (first aid, etc.)	None	None	NA
	Contingency, emergency, and recovery planning	Redundant capacity in terms of personnel	High	High	+
		Integration of risk reduction and resilience into development plans and policies	High	Moderate	+
		Existence of climate change and environmental policy and plans	None	None	NA
		Understanding risk patterns and trends	Moderate	Moderate	+
		Continuous and updated risk assessment, scenario making for different kinds of infrastructure and services (costs, losses, etc.)	None	None	NA
		Emergency planning and existence of emergency operations centre that integrates different agencies and organisations	None	None	NA
		Availability and update of contingency plans (e.g., post-storm traffic management)	None	None	NA
		Availability of mitigation plan	None	None	NA
		Early warning, evacuation plan, and access to evacuation information	None	None	NA
		Inclusion of transient population (tourist, etc.) in emergency planning	None	None	NA
		Inclusion of disaster resilience and lessons learned in the recovery plan	None	None	NA
		Speed of recover and restoration	None	None	NA
		Ongoing process of revising and monitoring plans and assessments	None	None	NA
		Standardised, updated, and integrated databases for action planning, monitoring, and evaluation purposes	None	None	NA
		Collaboration	Cross-sector collaboration (alignment of aims) and partnership among organisations	High	Moderate
	MOUs and MOAs with neighbouring communities and agencies within the broader region		High	Low	+
	Knowledge and information transfer and best practice sharing (inter and intra city)		High	High	+
	R&D	Innovation and technology update	High	High	+
		Research (funds, facilities) on risks and academy-society collaborations	High	Moderate	+
	Regulations / enforcements	Availability and enforcement of legislation (policing, crime, building code, environmental law, business law, etc.)	None	None	NA
		Management of informal settlements	None	None	NA
	Education and training	Behavioural issues and demand management	None	None	NA
Education (from elementary or secondary school, training, communication)		High	High	+	
Drills and exercises		None	None	NA	
Capacity building and enhancing awareness, dissemination of statistical data, and assessment results		High	High	+	
Incentives for encouraging mitigation and adaptation (including self-mobilising, self-organisation, etc.)		High	High	+	

The results of the retrodution process reduced the number of community resilience indicators to be considered from 129 to 73, with the innovation ecosystem and the innovation hub considered as not directly impacted impacting on 56 indicators in the environment dimension, emergency response, and land planning. Other indicators were considered as having potential for mixed impacts as both an enabler and inhibitor. For example, the innovation ecosystem and the innovation hub could be considered as enabling business cooperation as well as creating conflict. Finally, the innovation ecosystem and innovation hubs were expected to exclusively enable indicators relating to education and training, leadership, and economic dynamism.

4.6 Conclusion

Chapter 4 presented observations from the Australian innovation ecosystem and detailed review of the literature, aligning with the critical realist stages of explication and retrodution. The Australian and Queensland innovation ecosystem was examined in Section 4.2 to assess roles and scale, as well as growth of the Queensland context. Community resilience indicators were examined in Section 4.3, and an aggregate list selected for use in further hypothesis and the empirical corroboration stage. In Section 4.4, incubators' characteristics derived from literature were considered against what could be observed in the Australian innovation ecosystem to develop a working definition of an innovation hub. Information from these three constructs was then used to hypothesise in Section 4.5 about the enabling and inhibiting contribution of the innovation ecosystem and the innovation hub towards indicators of community resilience. This information provides a sense of a 'real' and 'actual' reality to consider against the empirical reality captured during the interviews and outlined in the results Chapters 5 and 6.

CHAPTER 5: RESULTS – THE ROLE OF THE INNOVATION HUB IN THE INNOVATION ECOSYSTEM

5.1 Introduction

This research aims to understand the role of the innovation ecosystem and the innovation hub in facilitating community resilience. To this end, Chapter 5 seeks to establish the role of the innovation hub in the innovation ecosystem. Roles are defined in this research as a set of norms, behaviours, and attitudes organised around one or more functions (Biddle, 1986). Chapter 5 focuses on research question one (RQ1) “What is the role of the innovation hub in an innovation ecosystem?” by identifying the roles (Section 5.2) and functions (Section 5.3) that emerged from the research interviews. Section 5.3 builds on this understanding to focus on the function of an innovation hub relative to other roles in the innovation ecosystem (Figure 5-1).

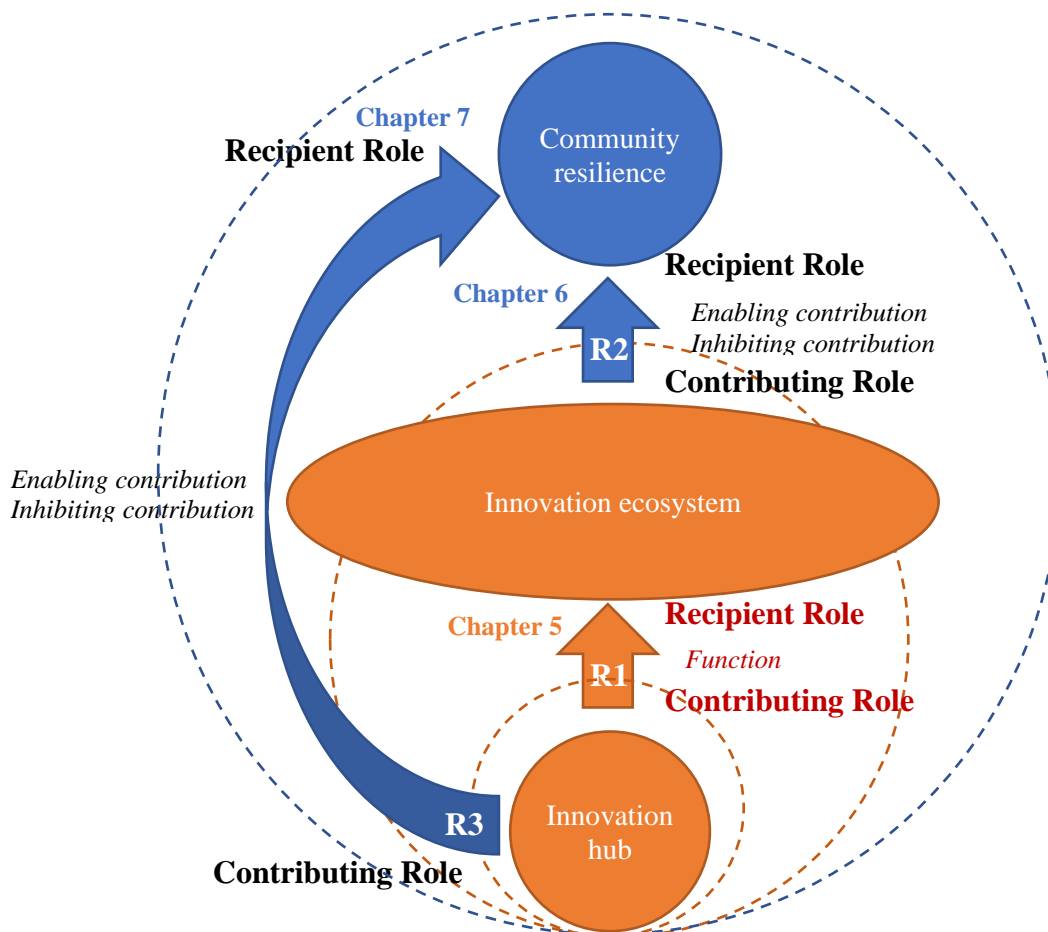


Figure 5-1 Research question addressed by Chapter 5 - The role of the innovation hub in the innovation ecosystem

5.2 Roles in the ecosystem

The roles in the innovation ecosystem were first identified from the literature presented in Chapter 2 and then observed within the Australian context, as explored in Chapter 4. These roles informed the research method by identifying initial interview participants. The Actor Network Theory perspective described in Section 3.3 necessitated that actors were approached in a manner that allowed roles to emerge rather than prescribing a predefined fixed model. Section 5.2 provides an explanation and examples for each role to support the role's designation and the distinction of the innovation hub from other roles. In total, fifty roles were identified and described through this process of empirical corroboration (Figure 5-2). Many roles were described explicitly, such as when referring to the chamber of commerce or local, state, and the federal government. Other roles were inferred, such as when referring to community or culture, or a sector, such as agriculture or tourism.

The roles were described differently by various stakeholders. An innovation hub explicitly stated they were a coworking space, but also described performing functions of an innovation hub. For example, developing and delivering entrepreneurial programs and obtaining government funding for entrepreneurial programs. The self-declaration as a coworking space could contribute to others in the region describing the organisation as merely a coworking space limited to offering desk space for hire and not as an organisation designed to broadly support entrepreneurs. Some roles were considered as a specialisation of other roles. For example, local governments performed functions of property developers, while the role of property developer was considered as distinct based on an organisation's sole purpose of developing physical assets in a region. Many roles perform media functions, while media is designated as a dedicated role that includes newspapers and websites.

Roles are comprised of individuals (employee, ecosystem leader); firms, organisations, program, and groups (service provider, hackathon program, library); and a concept or collective (culture, infrastructure, community). While all roles have the potential to enable or inhibit outcomes, concept or collective roles were not personified in an actor as compared to individual or firm roles. The role taking the focus rather than an individual actor could limit accountability. Issues could be focused on 'culture' or 'the board' rather than highlighting a single individual or organisation.

A categorisation has been applied to the roles based on what could be considered a shared attribute or set of functions unique to those roles. The list of roles is not meant to be

comprehensive nor exhaustive. The aim of this research is to focus on the role of the innovation hub; thus the focus on other roles provides an understanding of how the role of the innovation hub differentiates from other roles in the ecosystem and where functions are shared.

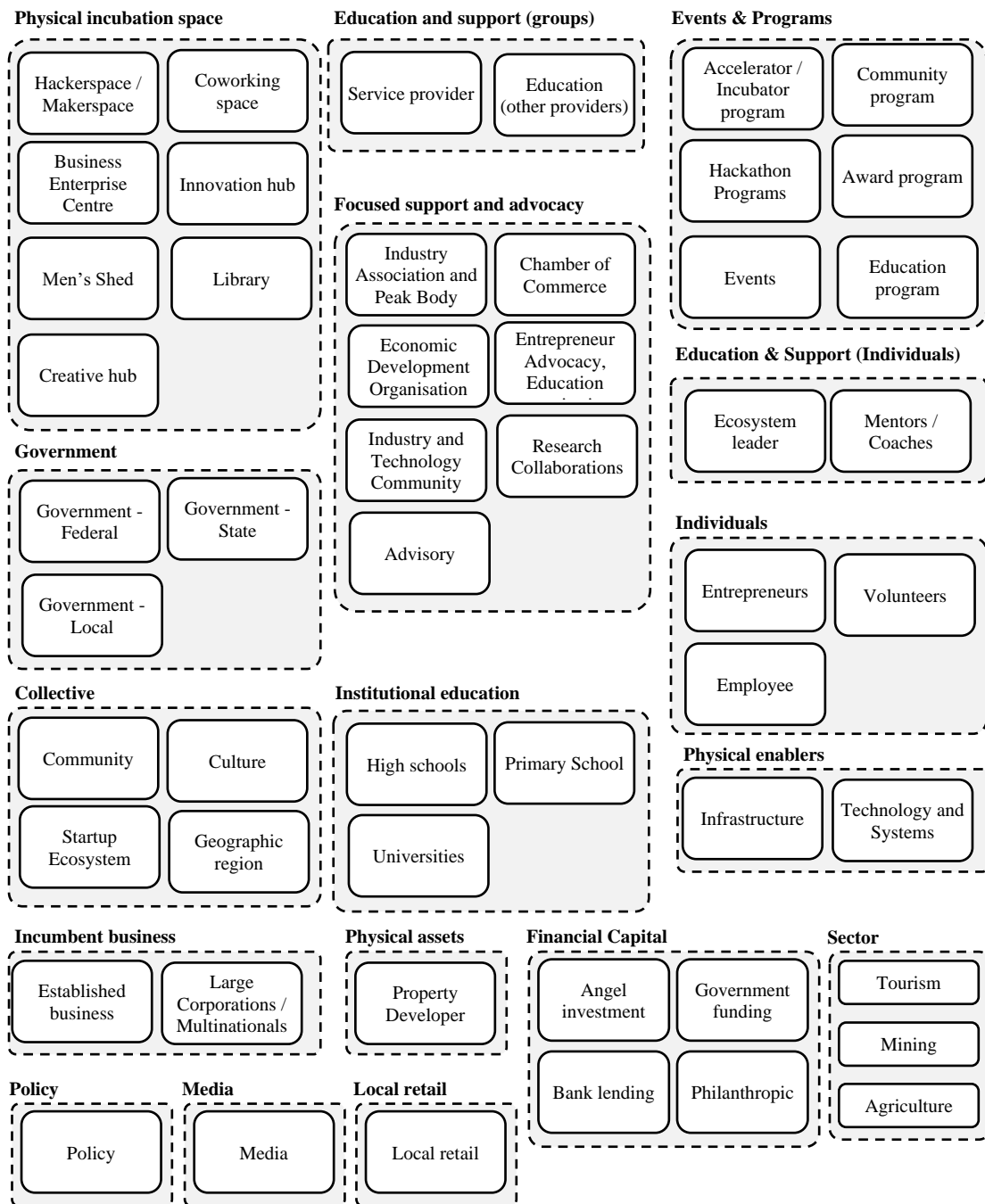


Figure 5-2 Roles in the innovation ecosystem

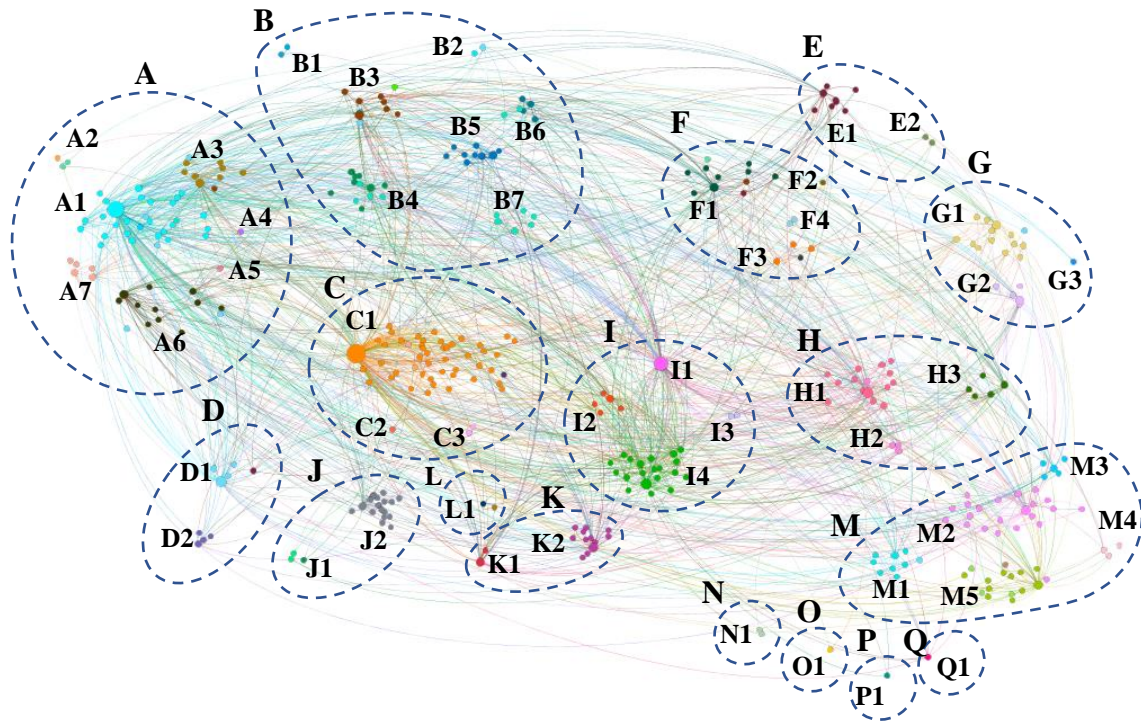
A social network graph was produced from the interviews to depict the structure and the characteristics of the innovation ecosystem (Leoncini & Montresor, 2000; Motoyama & Knowlton, 2016) (Figure 5-3). Frequency in the map is a factor of instances of interactions, rather than instances of coding. For example, a chamber of commerce may describe an

innovation hub interacting with a local government, which is one connection, regardless of the number of codes used to represent the interaction between the two roles. If a different chamber of commerce described an interaction between an innovation hub and local government, that is mapped as a separate interaction.

Both roles and actors are represented in the social network map as separate nodes. The role of innovation hub is a node, as well as each individual innovation hub actor mentioned. This is due to interviewees often referring to the role as the object of focus, such as “local government should apply policy”, while at other times referencing a specific local government council. Nodes are grouped together by role both spatially on the map and by node colour. Role clusters, such as physical spaces or government, are grouped into similar role categories.

While actors were frequently associated with multiple roles, in the graph actors are associated with the primary role used to describe the actor. For example, while a service provider may also be an ecosystem leader or an angel investor, they will be associated with a single role for the purpose of the graph. An individual actor may also be represented as multiple nodes under these same conditions, as one interviewee may describe the support received from an innovation hub and another references the support from the community manager as an ecosystem leader separate from the innovation hub.

The social network analysis in Figure 5-3 provides an overview of the ecosystem for the purpose of identifying various roles relative to innovation hubs. The graph is necessarily brief considering the depth of analysis that could be performed further describing attributes and interactions of each role and actor. Future analysis can examine the specific interactions focusing on each actor.



A. Physical incubation spaces

- A1. Innovation hubs
- A2. Business enterprise centres
- A3. Coworking spaces
- A4. Libraries
- A5. Men's sheds
- A6. Hackerspace / Makerspace
- A7. Creative hubs

B. Focused support and advocacy

- B1. Research collaborations
- B2. Advisory
- B3. Entrepreneur advocacy organisations
- B4. Industry and technology communities
- B5. Chamber of Commerce
- B6. Economic development organisation
- B7. Industry association and peak body

C. Individuals

- C1. Entrepreneurs
- C2. Volunteers
- C3. Employees

D. Education and Support (Individuals)

- D1. Ecosystem leader
- D2. Mentors / Coaches

E. Education and Support (Groups)

- E1. Service providers
- E2. Education (other providers)

F. Financial capital

- F1. Angel investment
- F2. Bank lending
- F3. Government funding
- F4. Philanthropic funding

G. Institutional education

- G1. Universities
- G2. High schools
- G3. Primary school

H. Government

- H1. Government – local
- H2. Government – state
- H3. Government – federal

I. Collective

- I1. Startup ecosystem
- I2. Community
- I3. Geographic region
- I4. Culture

K. Incumbent business

- K1. Established Businesses
- K2. Large corporations and multinationals

L. Local retail

- L1. Local retail

M. Events and programs

- M1. Events
- M2. Accelerator / Incubator program
- M3. Hackathon program
- M4. Award program
- M5. Education program

N. Policy

- N1. Policy

O. Physical assets

- O1. Property developer

P. Industry

- P1. Tourism

Q. Media

- Q1. Media

Figure 5-3 Social network graph of actors and roles, colour coded and arranged by role

Sections 5.2.1 to 5.2.17 describe each category and role based on interview excerpts supporting the designation of the role. These descriptions are provided to establish context for Chapter 7, which seeks to position the innovation hub relative to other roles. Supporting quotes from the interviews are provided to support the designation of the role through the interview data. A comprehensive definition of each role is beyond the scope of this research, but a brief overview

and indicative characteristics are provided. Roles are emphasised to distinguish the designation of the role from other descriptive text.

5.2.1 Collective category

The collective category includes constructs that are not defined by a firm or institutional boundary and made up of multiple individuals or groups. Roles in the collective category include *Community*, *Culture*, *Startup ecosystem*, and *Geographic region*. These are summarised with supporting quotes in Table 5-1.

The role of *Community* was described as unstructured and informal groups of individuals in a region acting, influencing, or being acted upon. Examples included ecosystem leader referring to *Community* in terms of community leadership, local government reflecting on community engagement, a chamber of commerce noting a lack of community coordination, a coworking space mentioning working for the community; a chamber of commerce reflecting on the history of the community; and a mentor noting community action such as education in the home. A challenge with considering *Community* as a role is that there is no point of accountability, highlighted when referring to community ownership.

Culture was described as the way things work in an organisation, community or region and acted as both an enabler and inhibitor to innovation ecosystem outcomes. *Culture* is a role when it is described as having a distinct persona enabling and inhibiting outcomes in the ecosystem. For example, the Australian culture was described as influencing an individualistic approach to doing business and as having a sense of ‘*tall poppy syndrome*’ that inhibited people from giving it a go for fear of others talking against their progress. *Culture* was also an actor in roles through artefacts, such as a ‘*culture code*’ in an innovation hub. Respondents described the embodied culture as something to be overcome or worked with, in the same manner as they would interact with other actors, such as a Chamber of Commerce or entrepreneur. Some saw the roles of *Community* and *Culture* as synonymous with the ecosystem overall.

The *Geographic region* was identified in interviews as a contributor to the innovation ecosystem based on different attributes related to geographic place. These attributes include remoteness and low population density, ecosystem boundaries spanning large geographic areas that have unique and disparate challenges, enablers or inhibitors inherent to a region (e.g., lack of career opportunities), culture aspects of the region (e.g., parochialism and willingness to try new endeavours), industry composition (e.g., mining or agriculture), and economic and social composition (e.g., access to technical talent, age profiles, lifestyle factors).

The *Startup ecosystem* was acknowledged as operating as a distinct collective role. Ecosystem maturity influenced the types of startups attracted to and supported in the region, as well as the characteristics of the support systems (e.g., government programs, local angel investor groups). The *Startup ecosystem* could also be defined by size, often used to compare growth or influence between regions. The *Startup ecosystem* was viewed as a separate and often oppositional to the community of incumbent businesses in the region. The *Startup ecosystem* as a role could be measured, known, and attract funding. Other roles acted to support the *Startup ecosystem* and conversely the *Startup ecosystem* impacted on and influenced other roles in the region.

Table 5-1 Collective roles identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Ecosystem Leader	Community	Innovation hub	Benefit	Accountability not only from the leadership but also from the community
Local government	Innovation hub	Community	Strategy	It's important that the community are actually part of the story.
Chamber of commerce	Community	Geographic region	Barrier	Too many people are trying to do the same thing and not collaborating.
Coworking space	Community	Coworking space	Benefit	We're owned by the community, run for the community. We want the community to be part of what happens.
Chamber of Commerce	Geographic region	Community	Barrier	The parochialism is a function of the adversity that the community has been occasioned by through natural disaster and political upheaval.
Mentor	Community	Innovation hub	Strategy	The [entrepreneur] conversation starts in the home.
Chamber of commerce	Culture	Established business	Barrier	In terms of everyday business, our approach culturally is that we make our own way.
Chamber of commerce	Culture	Community	Barrier	There is tall poppy in Australia. People do not want to think they are better than them.
Innovation hub	Culture	Innovation hub	Benefit	The innovation hub has a culture code we stand by. Our members follow that code. That's important when you're creating a community.
Ecosystem leader	Culture	Local government	Barrier	There are issues with the culture of local government versus the culture of entrepreneurship, which are radically different.
Local government	Geographic region	Startup ecosystem	Barrier	We're one of the largest and most diverse regions. Our massive geographic areas have different issues.
Entrepreneur	Geographic region	Entrepreneur	Barrier	A large problem is that people don't see career pathways here.
Ecosystem leader	Geographic region	Innovation hub	Benefit	The region is a beautiful place, known for its lifestyle. Geographically it offers amazing things, has incredible beaches, fantastic weather, beautiful river, national parks, that's attracted a really eclectic mix of people.
Ecosystem leader	Startup ecosystem	Financial capital – Angel investment	Barrier	Our startup ecosystem is very young. It would take another few years before there's deal flow coming from within the region.
Chamber of commerce	Startup ecosystem	Established business	Barrier	As a nation, we've become very big on startups, but we also need to be aware of supporting existing businesses to get through disruption.
Ecosystem leader	Startup ecosystem	Geographic region	Strategy	How many startups did we have, how did they succeed, and what is our measure of success? Shining a light on those kinds of challenges as a significant value to the local ecosystem.
Ecosystem leader	Startup ecosystem		Benefit	[The size of the ecosystem] is probably around about 300. It's a good, core group.

5.2.2 Education and support (individuals) category

Respondents described two roles fulfilled by individuals that provided education and innovation support in the region: *Ecosystem leaders*, and *Mentors or coaches*. Functions

performed include mentoring, leadership, and connecting - introduction to networks of other roles across the ecosystem. Roles in the education and support (individuals) category are summarised in Table 5-2.

The *Ecosystem leader* was described as operating on behalf of, synonymous with, and distinct from the support organisation where the leader worked, such as a consultancy, innovation hub, or local government. *Ecosystem leaders* were identified as a central connection point, providing entrepreneur support and leadership in the regions. *Ecosystem leaders* also act as a single point of failure, particularly in early stages of innovation ecosystem development and in low population density areas. Challenges with *Ecosystem leaders* include burnout, lack of capacity, and varying trust with personal relationships. *Ecosystem leaders* acted as a ‘keystone species’ that “interact in so many valuable ways with so many other parts of the ecosystem that their presence has a disproportionate impact on the system” (Hwang & Horowitz, 2012, p70).

Mentors and coaches were described as offering advice and support for entrepreneurs. Support from *Mentors and coaches* included advice based on technical expertise (e.g., legal, finance, or software expertise); advice based on industry expertise (e.g., agriculture, mining, or defence); access to markets and networks in industry sectors or customer segments; personal development and accountability; and advice on general business and startup principles. *Mentors and coaches* were associated with an innovation hub or physical incubator space, were part of education programs, and operated on their own on a fee-for-service basis. Ensuring the quality of *Mentors and coaches* was a concern, particularly in regional areas that did not have access to a diverse pool. Respondents raised concerns about *Mentors and coaches* accessing government funds to deliver programs with little impact for the entrepreneurs and difficulty in finding mentors that were a match for the entrepreneurs.

Table 5-2 Education and support (individuals) identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
University	Ecosystem leader	Startup ecosystem	Benefit	The ecosystem leader has good relationships with the other members of the entrepreneur advocacy group.
Chamber of commerce	Ecosystem leaders	Entrepreneurs	Benefit	She is the go-to woman for anything business-related.
Entrepreneur	Ecosystem leader	Industry and technology community	Barrier	You need one person who is charismatic, who identifies with the people, and creates an event that's worthwhile. Initiatives to bring people together didn't really maintain momentum. The ecosystem leader got busy.
Innovation hub	Ecosystem leader	High schools	Barrier	We're not actively driving the high school program because one of our founders is burnt out. I don't have capacity myself.
Entrepreneur	Ecosystem leader	Entrepreneur	Barrier	I have heard the ecosystem leader speak [negatively] about other people. I don't feel like what I say is in confidence.
Creative hub	Ecosystem leader	Startup ecosystem	Benefit	You identify the keystone species – the essential elements that provides for others. That's going to be human, wet, messy, complex, and systemic by nature. It's a cultural thing. It will resist mechanistic reduction.
Service provider	Mentor / Coach	Entrepreneurs	Benefit	Business owners sit down with a panel of three or four mentors with different skills and backgrounds.
Innovation hub	Mentor / Coach	Education program	Barrier	One person was sent over to work with us and delivered programs for coding and stem. Not everyone is equipped to work with [indigenous] kids.
Entrepreneur	Mentor / Coach	Entrepreneurs	Barrier	Because there is government money involved, they sniff around government money.
Entrepreneur	Mentor / Coach	Entrepreneurs	Barrier	If there was someone, probably a female that had done it before, that I could idolise and say that woman has actually done something amazing and she's exited and someone I could look up to, I would know I was getting proper advice.
Finance Capital – Angel investor	Mentor / Coach	Entrepreneurs	Benefit	He does legal mentoring, trademarks, intellectual property, those types of issues. It's a matter of trying to point them in the right direction and keep them moving along.

5.2.3 Education and support (groups)

Education and support groups were identified as providing support for entrepreneurs on an ongoing basis, providing skilled resources and talent outside of the institutional education service of schools and university. Roles in this group include *Service providers* and *Education (other providers)*. Roles in the Education and support groups category are summarised in Table 5-3.

The role of *Education (other providers)* includes providers of education that are not primary schools, high schools, universities, peak bodies, or service providers. This included organisations such as TAFE and non-government organisations (NGOs) focused on specific industry sectors or community groups. These organisations provide a source of talent and in some cases managed trade-specific innovation spaces including hackerspaces. Collaboration with TAFEs also provided legitimacy for innovation programs through academic certifications.

Service providers included accountants, lawyers, information technology providers, and manufacturing companies. Mentoring provided by the *Service providers* was identified as helpful, with innovation hubs and local governments, including *Service providers* as mentors as a service for members. *Service providers* were also described as exploiting government funding or pursuing startup entrepreneurs for fees. *Service providers* played an important role, but in lower population areas could be limited in capability to support innovation and technology, and early-stage entrepreneurs.

Table 5-3 Education and support (groups) identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Established business	Education – other provider	Startup ecosystem	Benefit	The TAFE system will be a good fit for talent development over the next 10 years.
Local government	Education – other provider	Entrepreneurs	Benefit	Education support providers, universities, TAFE, and others are key to talent. The ability for these businesses to grow from ‘creche’ comes back to talent or finance.
High school	Education – other provider	Accelerator program	Benefit	We worked with a local regional development association authority and local TAFE who put together a certificate three in entrepreneurship.
Service provider	Service provider	Innovation hub	Benefit	Our company will be a mentor. We're happy to do anything we can to assist and help.
Innovation hub	Service provider	Innovation hub	Barrier	We're mindful of those looking for a fee or consultancy arrangement. Keeping out the bad actors is something we need to do.
Finance capital – Angel investor	Service provider	Innovation hub	Barrier	If you want insurance, you'll either go to this guy or that guy and sometimes there's just one guy to go to and that's it.

5.2.4 Events and programs category

Events and programs were described as bringing people together to connect, provide content, and build capability. Roles in this category include *Accelerator and incubator programs*, *Community programs*, *Hackathon programs*, *Award programs*, *Events*, and *Education*

programs. Roles and comments relating to the events and programs category are outlined in Table 5-4.

Accelerator or incubator programs were described as short-term programs supporting individuals to develop ideas and grow their business. The *Accelerator or incubator programs* focus entrepreneurs' attention, are a conduit for mentors to engage with entrepreneurs, provide structure to innovation hub programs, and are an initiative to attract government funding. *Accelerator or incubator program* characteristics include access to mentors, introduction to networks, support for building teams, personal development, pitch sessions, and access to capital. The cohort aspect of the *Accelerator or incubator programs* was important for learning and business support within a community of trust. Accelerator programs were explained as focusing on rapidly scaling or 'accelerating' businesses in a specified period. In contrast, incubator programs did not necessarily have a timeframe, a cohort, or a set intake.

Award programs were described as a program with a specific focus on award categories to highlight successes and promote the region. The *Award programs* set innovative companies apart and provided exemplars for future leaders and within business communities. *Award programs* acted as a point in the year to bring different roles together to act as sponsors and participants. Dedicated categories focused attention on areas to build capacity and capability in the region, such as innovation in established businesses, new startups and entrepreneurs, industry sectors, and other segments of the community, such as females, indigenous, and youth.

Education programs were described as operating both within organisations, such as innovation hubs, as well as stand-alone activities. The *Education programs* included those specifically supporting entrepreneurs, such as overseas missions or founder mental health programs, technical programs such as STEM programs to teach coding, and ongoing government-funded programs supporting business growth. *Education programs* provided not just technical skills but also boosted confidence in participants. Beyond the *Education program* content for participants, programs act as a conduit for additional corporate and government sponsorship and a means for roles to engage with additional community groups such as youth or those with different learning abilities.

Events were described as a significant role in the ecosystem for connections, access to networks, sharing content, and communicating challenges. Event venues can be a pub or public space like a library, a dedicated venue like an innovation hub or coworking space, or other common areas, such as conference halls and civic centres. *Event* frequency can be annual for

major events, scheduled for routine events such as angel pitch sessions or meetups, or ad hoc. Quality is important, with low-quality pitches influencing the engagement of other roles in the ecosystem. Types of *Events* include major conferences (e.g., the Queensland technology conference Qode), regular community meetups, pitch sessions, general content, and community events, such as drinks and lunches.

The role of *Hackathon programs* – also referred to as Startup Weekends – describes intensive two to three-day events where participants developed new ideas, worked on technology, and created new businesses. Other functions attributed to the role included attracting mentors and sponsors, engaging the community, and building capability in leaders who then applied principles learned in capital cities to develop programs in their own ecosystems. *Hackathon programs* provide an entry point to entrepreneurship, an opportunity to launch businesses, and engage the entrepreneur community in local and corporate challenges.

Table 5-4 Events and programs identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Entrepreneur	Accelerator program	Entrepreneur	Benefit	The program helped me map out the strategy to take on this business idea that I have
Entrepreneur	Accelerator program	Entrepreneur	Benefit	By the end of the program, we had a team in Manila, a team in Sydney, people on the Gold Coast and me here on my own.
Peak body	Accelerator program	Entrepreneur	Benefit	Because they've gone through the program together for three months, they have trust and vulnerability
Accelerator program	Accelerator program	Innovation hub	Benefit	Facilitators in regional hubs said 'the training helped me feel confident in delivering the program. The content is familiar enough that I'm not just reading someone else's PowerPoint slides.
Local government	Award program	Established business	Benefit	It is not a business award; it is purely an innovation award.
High school	Award programs	Geographic region	Benefit	The awards promoted finding a problem and developing a solution which is the first stage of a startup. At that stage, there was barely any awareness around startups in schools.
University	Chamber of commerce	Award programs	Benefit	The business awards, having a young up-and-coming business or recognising entrepreneurial efforts in local chambers, gives chamber prominence, credibility, and legitimacy.
Coworking space	Education program	Entrepreneurs	Benefit	There is a significant demand in children who are on the autism spectrum, have aspersers, or other sorts of social anxiety issues that prevent them from speaking up in a group environment.
Entrepreneur	Education program	Entrepreneurs	Benefit	The program gave me the tools and inspiration to know I can pull myself out of that hole and that there are incredible women out there.
Coworking space	Local government	Education program	Benefit	We have had the support of the council, which was good.
Innovation hub	Events	Startup ecosystem	Benefit	Events bring us together. They are galvanizing; keep us connected and focused on not just our regions, but what's best for Queensland and how we create a better ecosystem in regional Queensland for innovators and entrepreneurs.
Financial capital – Angel investors	Events	Financial capital – Angel investors	Barrier	If an investor comes once and sees terrible pitches, they are never going to come back.
Industry association	Events	Industry association	Benefit	We were one of the major sponsors of the Myriad festival. It's a tech festival in Brisbane. We had representatives showcase what innovation means to us and the whole of Australia.
Mentor	Hackathons	Entrepreneurs	Benefit	The stories I go back to are stories about young kids who shine in startup weekends or hackathons.

Interviewee	Described from role	Acting on role	Relationship type	Quote
Entrepreneur	Hackathons	Entrepreneurs	Benefit	I didn't do anything with the idea until startup weekend. I pitched it and we won the startup weekend. The prize was to go to Paris for the global finals.
Ecosystem leader	Hackathons	Startup ecosystem	Benefit	Hackathons bring people from outside and introduce them to different ways of thinking and ideas that make a social impact.

5.2.5 Financial capital category

Respondents described four forms of financial capital: investment from *Angel investors*, *Government funding* in the form of grants, *Bank lending*, and financial support from *Philanthropic* sources. Investment was described as supporting the development and delivery of entrepreneur support services and equity or debt investment into startups. Financial capital acts as both a role and a function. A local service provider accountant develops the local angel investment network and is seen by entrepreneurs as the role of *Angel investment*. State government may be seen by the local innovation hub exclusively as the role of providing funding.

Angel investors provide funds to entrepreneurs. Developing a local angel group was identified as beneficial in regional communities. The angel network and local innovation hub had a relationship that could be considered symbiotic. The innovation hub developed the capability of the entrepreneurs to prepare them for investment and facilitated the development of the local angel network to ensure investment was available for entrepreneurs. The *Angel investor* provided mentoring functions and looked for a return on their investment. However, a lack of *Angel investor* and entrepreneurial experience could also result in a loss for both the investor and entrepreneur.

Government funding was identified as coming from federal (e.g., Incubator Support Grant), state (e.g., Business Development Fund, Ignite Ideas Grant, Advancing Regional Innovation Program), and local (e.g., direct innovation hub sponsorship or ownership) levels of government. The funding was applied to ecosystem support services, as well as direct to entrepreneurs. *Government funding* came with uncertainty, impacted by budgets and political election cycles. Ecosystem support service roles, such as physical spaces and education programs, shared a need to diversify income and not be as reliant on government investment. One program commonly noted was the Advancing Regional Innovation Program (ARIP), which provided 12 regions across Queensland with \$500,000 matching funds each. While

benefits of the program were identified as facilitating initial collaboration, barriers introduced included a lack of ongoing coordination between regions, challenges with delivering outcomes within a government framework, lack of agenda for outcomes, and fostering burnout in ecosystem leaders who did not have access to the funds distributed.

Philanthropic donors or a patron were identified as a financial resource to support the delivery of ecosystem services. Innovation and ecosystem services were funded by the government to realise economic and social outcomes for the local community. *Philanthropic funds* were one strategy to facilitate the transition away from reliance on government funds.

Table 5-5 Financial capital identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Ecosystem leader	Innovation hub	Financial capital – Angel investment	Benefit	Most of the angel investor meetings for the first six months were held with the innovation hub.
Financial capital – Angel investment	Financial capital – Angel investment	Entrepreneurs	Benefit	There's at least one angel who takes the startup under their wing, but you don't want all the angels getting involved with each startup, or it would get a bit chaotic
Financial capital – Angel investment	Financial capital – Angel investment	Service provider	Benefit	I invest for out of natural curiosity and wanting that professional growth. Working nine to five for the next 40 years and paying off the mortgage, we can try and put a bit of money away. There are better ways to try and find some good ideas to make some money.
Entrepreneur	Financial capital – Angel investment	Entrepreneur	Barrier	I don't think it was coming from a sinister place. They are not sinister people. It was just a handshake agreement on things that might happen. It didn't end up happening, and the relationship broke down considerably.
Hackerspace	Financial capital – Government funding	Hackerspace	Benefit	The hackerspace / makerspace opens, and I applied for an Ignite Ideas grant to develop the x-ray equipment.
Local government	Financial capital – Government funding	Entrepreneur advocacy body	Benefit	We got \$20,000 to develop a collaborative action plan.
Local government	Financial capital – Government funding	Entrepreneur advocacy body	Barrier	We created a committee with 31 collaborators. attempting to spend a million dollars over three years in an informed manner. As a consequence, we've raised expectations around what we can be doing.
Entrepreneur advocacy body	Financial capital – Government funding	Entrepreneur advocacy body	Barrier	We're finding out the hard way whether events work or whether you know how to engage government. If we had put our heads together for the past 12 months, it might have saved ourselves a lot of stress and angst.
Innovation hub	Financial capital – Government funding	Innovation hub	Barrier	Like the ARIP Program in Queensland, it's probably done more harm than good.
Entrepreneur advocacy body	Financial capital – Philanthropic	Entrepreneur advocacy body	Strategy	I would love to have a patron willing to put some money in, but we haven't found that person.
Innovation hub	Financial capital – Philanthropic	Innovation hub	Strategy	We're going to get more resources into our accelerator programs and resources through the government. In the medium term, it must come from high-value, self-funded programs with support from corporates and some philanthropists.

5.2.6 Focused support and advocacy category

Focused support and advocacy roles focused on supporting activity relating to entrepreneurs. Roles in this category include *Industry association and peak bodies*; *Chamber of commerce*; *Economic development organisations*; *Entrepreneur, advocacy, education, and support organisations*; *Industry and technology communities*; *Research collaborations*; and *Advisory groups*. Interview comments describing these roles are in Table 5-6.

The role of *Advisory groups* includes the functions of boards made up of individuals who offered advice, direction, leadership, accountability, influence, and access to networks (Table 5-17). *Advisory groups* were associated with individual organisations, such as those providing oversight for a university-owned innovation hub, and were cross-organisation, such as an advisory board of an entrepreneur advocacy organisation. *Advisory group* roles influenced the outcomes of the entrepreneur and innovation support services through the personal direction of actors in advisory roles.

The *Chamber of commerce* was described as supporting existing business and acting as a voice for business in a geographic region, industry sector, or segment of the community. The support functions provided by the *Chamber of commerce* varied depending on resourcing and leadership. For example, a *Chamber of commerce* that accepted funding from the local government was perceived as having limited ability to provide advocacy for small business against policies of the local government and instead focused on events and education. While some respondents made the distinction between *Chamber of commerce* services and innovation hubs focused on technology or business innovation, there were examples of *Chambers of commerce* introducing innovation programs in response to member requests.

Economic development organisations (EDOs) were described as organisations that supported economic development activities across a region made up of multiple local government areas (Table 5-19). These are distinct from *Chambers of commerce* who focus on smaller and local business and innovation hubs that focus on earlier stage potential high growth firms. *EDOs* tend to span a regional area greater than the local government boundaries but are often supported by the local government for specialist and outsourced economic development functions. *EDOs* vary from being focused exclusively on large infrastructure projects to providing direct support for entrepreneurs. This could be dependent on the capability of the leader in the *EDO*.

The *Entrepreneur, advocacy, education, and support organisation* described by participants was an organisation or group that provided support specific to entrepreneurs not attached to an innovation hub, not a formalised peak body, did not provide support direct to entrepreneurs. Support functions included advocacy, promotion, coordination of activities, and bringing other organisations together. The *Entrepreneur, advocacy, education, and support organisations* were often described by what they were not: not government but able to work with government, not a peak body but could bring peak bodies together, and not a chamber of commerce but provided support for emerging businesses. *Entrepreneur, advocacy, education, and support organisation* were a new form of organisation described as struggling for legitimacy and funding unless supported by other established support organisations, such as government or peak bodies. This lack of legitimacy and funding presented a challenge if the emerging group was viewed as in competition with incumbents such as chambers of commerce or economic development organisations that might be expanding services to support innovation and entrepreneurs.

Industry associations and peak bodies provided support for specific sectors such as the mining or food and agricultural sectors, to an institution group (e.g., schools or local government), or to a profession, such as economic development professionals. The described functions included supporting organisations like innovation hubs to deliver programs and events, supporting peak body members through research and strategy, advocating to government on behalf of their constituents, bringing industries together around events, and organising trade shows and events outside the region. *Industry associations and peak bodies* worked collaboratively with other support roles, such as innovation hubs and economic development bodies, providing services and support where there were shared members in each role.

The role of *Industry and technology communities* included groups of like-minded people meeting regularly to focus on general and specific technologies, such as the Wordpress software platform or other general programming, or functions such as entrepreneurship or social enterprise. These communities often used the online platform meetup.com to manage membership and event scheduling. The *Industry and technology communities* are often started by an individual who is passionate about a specific topic or cause related to innovation or entrepreneurship. A distinction was made between membership of the innovation hub and the *Industry and technology community* in the hub. Community did not necessarily develop within an innovation hub or coworking space based solely on a membership model. *Industry and technology communities* brought a sense of community into the innovation hubs and coworking

spaces and a sense of connection for local entrepreneurs. The physical space provided a ‘home’ for the *Industry and technology communities*.

The role of *Research collaborations* includes organisations that bring different organisations together to conduct and commercialise research. While other roles were described as performing the function as well, including *Industry associations and peak bodies* and *Universities*, the *Research collaborations* existed specifically to conduct and commercialise research. Examples included the federal government CSIRO and Collaborative research Centres (CRCs).

Table 5-6 Focused support and advocacy identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Advisory	Advisory	Innovation hub	Strategy	We [the board] had the innovation hub CEO recalibrate. He was being agnostic and trying to do everything. We got him focused on sectors more relevant to the economy and aligned to the university's activities.
Creative hub	Advisory	Creative hub	Benefit	One of the board members felt to create a sense of community with an event based around food with no specific agenda.
Innovation hub	Advisory	Innovation hub	Benefit	We've got a guy on our board who's brilliant, an innovative thinker. The influence he has on the chamber is just phenomenal.
Creative hub	Advisory	Creative hub	Benefit	One of our board members was facilitating this program where people that are identified as disabled.
Coworking space	Chamber of commerce	Established business	Benefit	The chamber of commerce is focused on existing businesses helping make them more sustainable, more viable, a little bit of expansion, but making sure they don't close.
Chamber of commerce	Chamber of commerce	Established business	Benefit	In my view, chambers were established predominantly for advocacy.
Chamber of commerce	Chamber of commerce	Established business	Benefit	If we were a function of Council, then you've lost your independent voice for business.
Chamber of commerce	Chamber of commerce	Entrepreneurs	Benefit	The traditional chamber model doesn't meet the needs of very niche and emerging businesses that require support when they're in significant stages of growth.
Chamber of commerce	Chamber of commerce	Entrepreneurs	Benefit	We want to be able to hold events where people spend time on their business rather than just in it.
Economic development body	Economic development body	Geographic region	Benefit	We've got a list of eight infrastructure and policy priorities in the region that we advocate to state and federal government, not really advocate to local government which tends to be more the domain of Chambers.
Economic development body	Economic development body	Local government	Benefit	We are chartered by the regional council for business outcomes. We play a part within their economic development charter, and the council look after more of the social aspects.
Economic development body	Economic development body	Geographic region	Benefit	Our role is to put people together and make the region a better place to live. It's a better place to live when there are more people in it, and more people will come when there are good, secure, well-paying jobs.
Ecosystem leader	Entrepreneur advocacy group	Startup ecosystem	Vision	It needs to be a fully-funded person whose entire job is to connect parties in the startup ecosystem together.

Interviewee	Described from role	Acting on role	Relationship type	Quote
Economic development body	Economic development body	Entrepreneur advocacy group	Barrier	The challenge when committee driven and government reporting, they're the antithesis of innovation. That keeps it constrained. Next phase is to have it more of an industry-led.
Entrepreneur advocacy group	Economic development body	Entrepreneur advocacy group	Barrier	The advocacy group just runs events. They didn't attempt to become an accelerator or lobby group for startups. You've got competition with the new economy thinking from the traditional economic development people. Getting cohesion is very difficult, particularly when economic times are tough. Things get nastier.
University	Entrepreneur advocacy group	Startup ecosystem	Strategy	There are people that would like an independent body that's not tied to government.
Local government	Entrepreneur advocacy group	Local government	Benefit	We worked with peak bodies because they're the ones who have that direct contact with the corporates because otherwise, we'd be spreading ourselves too thin.
Chamber of commerce	Entrepreneur advocacy group	Community	Strategy	Whether it's a not for profit or charity, some kind of support or community network to step into a void and connect up parts of the community.
Industry association / Peak body	Industry association / Peak body	Innovation hub	Benefit	We've partnered with the innovation hub on the accelerator program.
Entrepreneur	Industry association / Peak body	High schools	Benefit	A lot of businesses have formed. The peak body runs a series of breakfasts, which high schools go to, and they also run the careers expo.
Entrepreneur	Industry association / Peak body	Entrepreneurs	Benefit	The peak body has been phenomenal, they've organized a trade show in Brisbane
Entrepreneur	Industry and technology community	Entrepreneurs	Benefit	We created an event every second weekend, someone would sponsor it, we would have free beers and pizza, and it was just a social event for people to get together, to get a melting pot of people that are looking to do things in the area.
Entrepreneur	Industry and technology community	Community	Benefit	We're about to start a computer recycling program as a social gathering and then find people in the community who are affected by the digital divide.
Ecosystem leader	Industry and technology community	Innovation hub	Benefit	When the hub does the outreach for the purpose of getting more bums on seats, it's disingenuous compared to the outreach of 'I just want to grow the community' - when the community does the outreach, it's a very different scenario.
Ecosystem leader	Research collaboration	Entrepreneurs	Benefit	The research collaboration produced a trial for gluten free barley. Then they needed some farmers to be able to grow it because the research collaboration also had the beer producers in Germany who wanted to buy the product.

5.2.7 Government category

The role of government included federal, state, and local governments. Each level of government was described as having unique functions, although some functions, such as funding, were common among all three levels. Narrative examples of government roles are provided in Table 5-7.

The role of *Federal government* related to functions of funding, seen as enabling the support for programs and spaces while also perceived as inhibiting outcomes when funding stopped and actors needed to find other forms of financial support. The structure of the federal programs was viewed as limiting as innovation hubs aligned delivery to match the funding requirements and governance constraints on alternative funding models were seen as disincentivising activities that would allow securing additional funding streams. Finally, the federal role in supporting state government infrastructure was noted for regional infrastructure of roads and internet connectivity.

State government was described as supporting through funding programs, defining strategic focus and directing the narrative across the state, directing federal funds to local projects, and connecting opportunities between regions. Examples of specific initiatives included the Queensland state government's Ignite Ideas grant to scale new businesses, the Advancing Regional Innovation Program (ARIP) which focused innovation efforts in regional areas, and regional startup hub funding that provided operational funds to regional innovation hubs. Challenges with *State government* included delays in receiving funds, ambiguous outcomes and expectations, and challenges related to funding including reporting and constraints about what can be done and how the programs should be promoted.

Local government was described as a dominant role in regions contributing funding, advocacy, and support for entrepreneur support activities. *Local government* was able to directly influence local impacts, including offering local design challenges, as well as establishing and adequately funding innovation hubs and accelerator programs. Barriers to local government support included bureaucracy, slow speed of response and conflicts in working with other private entrepreneur support organisations.

Table 5-7 Government identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Innovation hub	Federal government	Innovation hub	Barrier	There have been federal government budget constraints impacting on the programs.
Innovation hub	Federal government	Accelerator program	Barrier	We don't want our program to be only for people in this geographical area which is in conflict with the federal program.
Education program	Federal government	Education program	Barrier	The program is funded through department of jobs. Everything needs to be free.
State government	Federal government	Geographic region	Benefit	Lobbying the feds to give money to transport and main roads to fix the thing.
Local government	State government	Innovation hub	Benefit	Get money from the state government to get the innovation hub going to provide the operating expense, selection, reorganization, new people.
State government	State government	Geographic region	Benefit	I see opportunity for those two regions to collaborate where one has a strength in one area or another might have a strength in another area.
Innovation hub	State government	Innovation hub	Barrier	We were going to be September, it's now November, hopefully the funding will come through that will allow us to employ a young person four hours a day.
University	State government	Startup ecosystem	Benefit	We might think the government's agenda towards innovation and entrepreneurship hasn't been realized, but it's certainly changed the conversation. That's a long-term culture change that happens over time.
Entrepreneur advocacy body	State government	Entrepreneur advocacy body	Barrier	I was uncomfortable about state government money. As part of taking that money, we also need to promote things that state government is doing and we don't necessarily agree with everything the state government's doing.
Local government	Hackathon	Local government	Benefit	We did that two-day design sprint with 100 students. We bought our problems and they came up with solutions and did that for two days and then we reviewed them and judged them.
Chamber of commerce	Local government	Entrepreneur advocacy group	Barrier	The concept that an organisation owned by council is going to create an innovative environment is incongruent. They're Government, bureaucratic by nature, so I reckon we're not going to get innovation because they're owned by council.
Accelerator program	Local government	Innovation hub	Benefit	The innovation hubs funded and run by local government are typically resourced at a level where they can say, 'Yep, this is important. Let's just do it.'

5.2.8 Incumbent business category

The role of incumbent businesses pertained to businesses that are already established in a region. These roles include *Established businesses*, and *Large corporations and*

multinationals. While similar, the distinction between the two roles is based on size and influence relative to the perception by other roles. Exemplar comments related to these roles are outlined in Table 5-8.

Established businesses were described as existing businesses in the region. The businesses were referenced in terms of sponsoring innovation activities, as distinct between startups and technology companies, and as candidates for providing mentoring by other roles such as innovation hubs, and as having potential to pay for innovation services such as workshops and programs. The transition from early-stage entrepreneur to *Established business* was not always clear or seamless, as companies found that support mechanisms for early-stage enterprises were no longer available or became more difficult to attain. While some programs intentionally set out to support *Established businesses*, other innovation-focused programs made it a point to avoid supporting *Established businesses*.

Just as there was a distinction made between startups and *Established businesses*, there was also a difference between *Established business* and *Large corporations and multinationals*. The latter role was described as providing similar functions as government, such as being a source of larger, long-term funding and setting challenges to solve. *Large corporations and multinationals* had the capacity and capability to deliver their own programs for community engagement and were desired by government and universities for ‘industry-led’ programs. In contrast to *Established businesses*, *Large corporations and multinationals* had the capacity to provide more sustainable support for innovation activities, including establishing their own innovation assets such as innovation hubs and programs. When it came to supporting existing regional activity, however, *Large corporations and multinationals* received similar criticism as the role of government related to bureaucracy and slow speed of decision making.

Table 5-8 Incumbent business identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Innovation hub	Established business	Innovation hub	Benefit	The other money we raised from small to medium size businesses around the region that wanted to support what we've been doing.
Ecosystem leader	Established business	Startup ecosystem	Benefit	It's traditional businesses that have found an area where they can solve a problem for their clients.
Established business	Financial capital – Government funding	Established business	Barrier	It's okay when you start off small and we can do everything. The bigger it gets, the more money, connections, outlay. There comes a time where you apply for grants to get assistance but there's been this many people in that range, which means that you've lost out.
Accelerator program	Accelerator program	Established business	Barrier	Supporting small businesses makes no economic sense - if you make the hairdresser more successful by making them digitally enabled and upskilling them and making them entrepreneurially wired, they are only successful at the expense of the other three hairdressers in their suburb.
Chamber of commerce	Large corporation or multinational	Chamber of commerce	Benefit	A large corporate funded the program. That was Australia wide.
Large corporation or multinational	Hackathon	Large corporation or multinational	Benefit	Hackathons, we will participate in them.
Industry association / Peak body	Large corporation or multinational	Entrepreneurs	Benefit	The stuff that I find really exciting is the corporate program around raising skills and awareness of indigenous women in our remote indigenous communities.
Innovation hub	Large corporation or multinational	Innovation hub	Barrier	By the time we'd gotten those local managers on board, to then get the other regional managers to understand, and then the decision gets sent to Melbourne, and for an amount like \$5,000, they don't know shit about the region whatsoever and your three, four, five months go down the toilet. But you still have a try.

5.2.9 Individuals category

Roles in the individual category focus on the person rather than the institution. These include the role of *Employee*, *Volunteer*, and *Entrepreneur* and were referenced as the individual as well as a collective, e.g., “attracting entrepreneurs to the region”, “upskilling employees”, or “avoiding volunteer burnout”. Examples for *Employee* and *Volunteer* roles are outlined in Table 5-9, and examples for the *Entrepreneur* role are expanded in Table 5-10.

The role of *Employee* included individuals who worked for a business and who did not identify as an entrepreneur or the business itself. The employee did not share the risk profile of the business founder but did experience the enabling and inhibiting factors of the innovation ecosystem. The innovation ecosystem provided a means to connect employees to entrepreneurs through physical spaces of innovation hubs and coworking spaces, and programs such as accelerators and hackathons. Employees were referenced by entrepreneurs, government, and industry groups as desirable to attract and needing to develop technical skills.

Volunteers were described as a vital role in the operating of the ecosystem to supplement paid staff, bring in revenue, and were often the only way that low- or non-funded programs could be delivered. *Volunteers* came from different areas, such as schools or the business community. A distinction between *Volunteers* and paid workers was made in terms of willingly working for a cause or working for free out of obligation. The lack of payment meant that other commitments, such as family or paid work, could inhibit volunteer efforts. Innovation hubs leveraged volunteers for services to support operational costs, even as managers described challenges of needing additional time to manage volunteers and volunteer burnout from working without financial support.

Table 5-9 Individuals (employees and volunteers) identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Employee	Hackerspace	Employee	Benefit	I got the role when I met my employer at the hackerspace.
Entrepreneur	Innovation hub	Employee	Benefit	I'm lucky to stumble across John at the innovation hub. After a chat to work out where his strengths are, John's come onboard, we're doing development in-house, and writing all the code for the new hardware.
Hackerspace	Volunteers	Hackerspace	Benefit	People volunteer their time to bring in extra money to meet our obligations of rent, utilities, and things like that.
Coworking space	Volunteers	Education program	Benefit	We volunteer our time on Saturdays during the school term to teach kids computer programming.
Innovation hub	Volunteers	Innovation hub	Benefit	We got our horsepower from the mentor and expert in residence panel that we can draw from to connect with our members. Without that horsepower, we wouldn't have the capability to get the outcomes. Volunteers include students close to graduation and people that have been in business that want to give back and just assist with their time.
University	Entrepreneur advocacy body	Volunteers	Barrier	The moment you formalize, it feels like work. When you do it informally on a volunteer basis, it feels like you're doing it because you care and you want to. You have real tensions between those two things.
Hackerspace	Hackerspace	Volunteers	Barrier	I've worked full time and got a baby so this is very much a volunteer thing I do outside of hours.
Creative hub	Advisory	Volunteers	Barrier	The board comment was made that we need more volunteers. And I said, 'That's great, but I don't have enough for the current volunteers to do.' Now I need to look to the board and say 'What is it that you want them to do? What are the projects?'

The role of *Entrepreneur*, also referred to as founder, was described as individuals who start and were responsible for an organisation or business-related initiative. The *Entrepreneur* was characterised as putting in their personal capital and having personal stakes in either risk or reward of the outcomes. This distinguishes the *Entrepreneur* from an employee who does not risk personal financial capital or a hobbyist who would not have the opportunity for personal financial gain from their investment.

Several different types of *Entrepreneurs* emerged from the research, as outlined in Table 5-10. The distinction is made in the role of *Entrepreneur* based on demographic characteristics (e.g.,

indigenous, youth, male, female), industry sector (e.g., automotive, creative, agriculture), geographic location (e.g., rural or regional), experience and background (e.g., successful, recycled, socially disadvantaged), and business model (e.g., technical, traditional, startup, hacker/maker). The structure of the innovation ecosystem enabled or inhibited the various forms of *Entrepreneurs* through the focus on programs and personal emphasis of leaders reinforcing or opposing various forms of the *Entrepreneur* role.

Table 5-10 The role of Entrepreneur identified in the innovation ecosystem

Entrepreneur type	Description	Interviewee	Exemplar Quote
Entrepreneur - automotive	Entrepreneurs focused on the automotive industry	Innovation hub	If you were an automotive or a mobility business or startup, we can open up our industry for you, help you meet people, introduce you to the right businesses that can help you scale your business.
Entrepreneur - Creative	Entrepreneurs focused on the creative sector or using creative technologies (video gaming, mixed reality, arts, entertainment)	Ecosystem leader	The exposure to mixed modality, different industries, especially creative industries and having them participate in the entrepreneurial journey is where I see growth and value for startups that come through these places.
Entrepreneur - disability	Entrepreneur focused on providing support for the disability sector	Creative hub	We've identified this young man who is 22 or 23 and a high functioning autistic. We thought we could maybe help him create a micro-business, which would be a radio station.
Entrepreneur - Female	Entrepreneurs who identify as female	Innovation hub	When I first started the coworking space running 'momprenneur' programs, the focus was on helping women find that identity within themselves where they can achieve what it is they want to achieve.
Entrepreneur - Food and Agriculture	Entrepreneurs focused on the food and agriculture industry	Chamber of commerce	The accelerator program is for a niche cohort within our membership that operate within the food production, hospitality, food, tourism and food manufacturing sectors.
Entrepreneur - Hacker / Maker	Entrepreneurs focused on physical materials, often with high experimentation and without an immediate commercial business model	Hackerspace	If someone walked in here, developing a product that makes them millions of dollars, fantastic. If I see someone who's socially disadvantaged and this gives them an outlet to escape that and pursue something they're passionate about for their own sake. Both of them are equally weighted as positive and damn good achievements of what the space can do.
Entrepreneur - indigenous	Entrepreneurs who are indigenous	Education program	It's trying to break down those barriers that indigenous people can run business.
Entrepreneur - Male	Entrepreneurs who identify as male	Entrepreneur	If I say to my wife, I'm starting something else, she's going to kill me.
Entrepreneur - Mature	Entrepreneurs viewed as older	Local government	We're also focused on the 45 to 55-year-old people who go 'My skills are no longer required, I need to reskill'. I'd like to think that the digital hub and the education pathways that wrap around that, which is another program to help transition people.
Entrepreneur - recycled	Entrepreneurs who have been successful and have the potential to mentor, invest, or start a new venture	Entrepreneur	I'd say a lot of people that have like exited and moved up here from interstate or internationally kind of retire. He's getting them out of that retirement mentality into creating some new ventures or funding ventures.

Entrepreneur type	Description	Interviewee	Exemplar Quote
Entrepreneur - regional	Entrepreneurs located outside the greater metro areas in regional, rural, and remote locations	University	Then you have some sort of satellite out in the middle of a rural and regional Queensland where you have a group that will be part of your journey that allows you to tap into the business community or that innovation environment.
Entrepreneur - socially disadvantaged	Entrepreneurs from other socially disadvantaged communities.	Education provider – other	We want good support for the people coming out of prison connecting with their local startup ecosystems and being accepted into those ecosystems, which we found has been a little bit of a problem in some areas because of their background.
Entrepreneur - sole trader	Entrepreneurs who manage their own business, often do not have employees, and whose service is directly related to them providing the service.	Innovation hub	Some of my members here are sole-traders, and they rely purely on themselves to make a living for themselves. You see how much they want it, but they have to overcome all of their insecurities and concerns to be able to achieve what they need to make a living.
Entrepreneur - Startup	Entrepreneurs who are starting a firm designed for high growth, with a large addressable market, and likely use new technology and have an innovative product or service	Accelerator Entrepreneur	People who are working on globally scalable ideas and who are capable of becoming entrepreneurs.
Entrepreneur - Successful	Entrepreneurs who currently manage or have had successful businesses.	Chamber of commerce	They do their own hubs because they attract each other. He's operating in a different sphere.
Entrepreneur - Tech	Entrepreneurs who use technology as a main part of their business.	Chamber of commerce	The basic service of the hub as a coworking space with mentors is that sort of techy entrepreneur sort of side. Those tech-based entrepreneurs don't see that benefit in networking face-to-face, hence the reason they are in the game they are.
Entrepreneur - Traditional	Entrepreneurs who have a more traditional business model, likely non-technical and are not considered a startup.	Accelerator	There is a big risk that in some regions, if there aren't a bunch of people who are already looking at tech startup ideas or scalable startup ideas that they end up running the program for small businesses and it's not a small business program.
Entrepreneur - Young	Entrepreneurs viewed as younger	Service provider	I've hired a 14-year old kid at local high school. He taught himself python from a book and he's keen to explore that more, very smart, talented guy.

5.2.10 Institutional education category

Institutional education included formal accredited education of primary schools, high schools, and universities. Vocational education organisations, such as TAFE, were also mentioned but are listed under the category of education providers (other). Example narratives for the institutional education category are listed in Table 5-11.

The roles of *High schools* and *Primary schools* were synonymous with the concept of young entrepreneurs and retaining talent in the regions. Youth engagement in entrepreneurship was identified as beneficial, while there were challenges identified in engaging with schools in regions due to changing staff at schools, fitting programs into a busy curriculum, and inconsistent decision-makers. Schools participated in external programs as well as developed programs internal in the schools. Programs introduced in schools could be the start of a young person's entrepreneurial journey, which would continue years after graduation. Technology and entrepreneurship programs also emerged within schools, replicating fee-for-service programs previously delivered by hackerspaces and causing the hackerspaces to continue to adapt their services to differentiate. The role of *Primary schools* was mentioned less as a specific role than *High schools*. Some *Primary school* STEM and basic entrepreneurship courses were identified.

The role of *University* was identified with several functions, including research, providing talent, providing funding, and owning innovation hubs. *Universities* both supported external programs as well as delivered spaces and programs on their own. Similar to other roles supported by large institutions such as government and corporate, challenges related to *Universities* included bureaucracy, lack of single accountability, slow decision-making processes, and competition from university-owned incubator assets competing with a local innovation hub or coworking space.

Table 5-11 The role of Institutional education identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
High school	High school	Entrepreneurs	Benefit	We set up a school department as part of this role, the coding and innovation hub, which is the outward-facing part of our faculty department at school.
High school	High school	Entrepreneurs	Benefit	The youth accelerator program helped me map the strategy I need to take this business idea. I can finally say it's coming together two years.
Hackerspace	High school	Hackerspace	Barrier	High schools begin doing programs we started in the hackerspace, so hackerspaces need to move to more unstructured programs or evolve.
Ecosystem leader	High schools	Innovation hub	Barrier	I'm leading a strong youth entrepreneur program to ensure that we have all our schools involved. It's the death of me. Youth entrepreneurship is so hard compared to everything else we do. It is hard to get the schools engaged in this region.
Innovation hub	Innovation hub	Primary schools	Benefit	If you take a 10-year view, you could transform and have a talent base that can take advantage of opportunities in the sector. We are working closely with a number of our local schools, both at the primary and high school level to inspire and enable students to understand beyond what they see in their day to day lives.
Innovation hub	Universities	Innovation hub	Benefit	I have the IT course on board so they'll be giving us their interns next year.
Local government	Universities	Innovation hub	Benefit	One of the three mentors is employed at the University for financial support.
Entrepreneur advocacy group	Universities	Startup ecosystem	Barrier	The university is engaged in this work that can be insular and have boundaries around people's engagement into the community.
University	Universities	Innovation hub	Barrier	The entrepreneurial spaces is not owned by any division in the university. No one has total responsibility for [entrepreneurship] in the university overall.
Coworking space	Universities	Coworking space	Barrier	We've held events in the coworking space that the university has been involved with but it's difficult since the university is aligned with the university-owned innovation hub.

5.2.11 Local retail category

Local retail included amenities such as cafes, gyms, and other aspects that supported the liveability of the local region and were identified as important to respondents. Comments related to the *Local retail* role are described in Table 5-12. *Local retail* often provided the physical space in early stages of startup activity, with hackerspaces, coworking spaces, and innovation hubs starting in other local third spaces such as libraries or pubs. Local retail helped

attract people to the region and supported the local innovation spaces. The local entrepreneur ecosystem could also be seen in competition with *Local retail* over political support and funding. A lack of *Local retail* could also impact the ecosystem by not attracting employees and entrepreneurs who looked for basic quality of life amenities such as gyms.

Table 5-12 The role of *Local retail* identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Coworking space	Local retail	Entrepreneurs	Benefit	We've got lots of shops and bars and restaurants and things. That's really important to have near a space. You can't just be stuck in a building in the middle of nowhere. You need to be able to get out.
Hackerspace	Local retail	Hackerspace	Benefit	We started as a hackerspace, connected with other techs, and started in the pub.
Chamber of commerce	Startup ecosystem	Local retail	Barrier	As a nation we've become very big on startups, but in terms of funding, existing businesses are struggling. We need to be aware of supporting existing businesses to get through disruption.

5.2.12 Media category

The media category contains the single role of *Media* for communicating messages relating to the innovation ecosystem. The role of *Media* was described as channels and organisations to promote activities and influence others in the community specific to innovation and entrepreneurial outcomes (Table 5-13). The role was performed within larger institutions, such as local governments, as a dedicated media channel focused on entrepreneur activities and niche markets, as well as through established media, such as local newspapers and television. *Media* was viewed as necessary but required resources to leverage, resulting in larger funded hubs and programs making use of the *Media* role while smaller operators might struggle to get the word out. Being strategic about *Media* and dedicated channels was important to focus attention as hubs and programs specialised on specific sectors or community groups. A risk was described as having a message that was overly positive or politically motivated, which could result in not addressing core challenges.

Table 5-13 The role of Media identified in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Ecosystem leader	Media	Innovation hub	Benefit	I have a spot on the radio where I talk about innovation every week to encourage existing businesses to be innovative and link into tech and the hub.
Local government	Local government	Media	Strategy	So how do we promote, how do we encourage, how do we even tell the rest of the world that these are the collaborative environments that we want to have a to occur in the region?
Creative hub	Media	Education program	Benefit	We use established networks and disability groups to push that message and mainstream advertisers as well as businesses that work in disability.
Hackerspace	Hackerspace	Media	Barrier	We're not doing as much media and promotion as we'd like, but we don't have the resources.
Ecosystem leader	Media	Startup ecosystem	Barrier	Some people say it's the entrepreneurial capital of Australia, but it's not really. It's forced entrepreneurship with a lot of people who can't find regular employment. They're working for themselves with the average salaries really low. You cannot believe that hype.

5.2.13 Physical assets category

The Physical assets category includes the role of *Property developer*, with functions exclusively focused on developing and managing the physical assets in a region. The role of *Property developer* was related to the development of physical spaces, including coworking spaces and innovation hubs (Table 5-14). *Property developers* were viewed as a threat by other self-funded coworking spaces while acknowledging the value of increasing awareness that comes from a funded project. Other roles, such as *Local government*, could act as a *Property developer* or partner with *Property developers* to build physical spaces for the innovation ecosystem as the next stage after business creation in the local innovation hub.

Table 5-14 The role of Property developer in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Local government	Local government	Property developer	Strategy	Local developers and property owners are keen to accommodate not only the tech sector but the coworker explosion to ensure that we're delivering the service needed to move businesses out of the 'creche' into 'the high school' and then into the units and beyond.
Coworking space	Property developer	Coworking space	Barrier	We're seeing a lot of the real estate agents moving into the shared model. It is becoming more competitive, but the awareness that there are other opportunities out there is helping change people's awareness of what's going on.

5.2.14 Physical enablers category

The physical enablers category includes two roles of *Physical infrastructure* and *Technology and systems*. These roles are characterised by physical hardware or infrastructure that enabled innovation outcomes. Examples of narratives relating to the physical enablers category are in Table 5-15.

The role of *Physical infrastructure* was described in relation to internet connectivity and transport and logistics, including roads, airports, and sea freight. *Physical infrastructure* was deemed as critical for innovation outcomes. A new internet submarine cable which was considered to be helpful, while lack of internet connectivity in regional and remote areas was a significant barrier for entrepreneur activity.

The role of *Technology and systems* included references to digital communication platforms (e.g., Facebook, Slack), physical systems (e.g., whiteboards), and equipment (e.g., 3D printers). These items acted as enablers to support established businesses to innovate for a competitive advantage and sustainability, facilitate outcomes in innovation hubs, and contributing to culture and connections in accelerator programs and coworking spaces. *Technology and systems* activated third spaces, such as equipment that turned a library into a makerspace or a virtual reality station that became the focal point for creative entrepreneurs in an innovation hub.

Table 5-15 Physical enablers in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Federal government	Physical infrastructure	Innovation hub	Barrier	If we don't fix the road in the region, the value that the innovation hub could have created isn't there when the whole stretch of road is useless to people who want to move freight.
Federal government	Physical infrastructure	Entrepreneurs	Vision	What's going to wreck entrepreneur outcomes is poor infrastructure. We want to capitalize on the airport expansion. We're particularly interested in looking at freight opportunities, food exports that are really time sensitive.
Innovation hub	Physical infrastructure	Innovation hub	Benefit	We've got a new cable coming that's going to be huge extra capability for the region and for Queensland as well.
Ecosystem leader	Physical infrastructure	Geographic region	Barrier	I've worked in many regions of Australia which are more rural and remote. You cannot even get a mobile signal. They had to travel about a two to three hour trip each way to get signal.
Entrepreneur	Technology / System	Entrepreneurs	Benefit	He had this room in the innovation hub with all white walls everywhere. He unpacked the whole brain and wrote on every wall everything that we're doing.
Large corporate / Multinational	Technology / System	Large corporate / Multinational	Benefit	We've had one of our worst seasons on record but had you had the machinery that we had 15 years ago you probably would not get a crop planted.
Hackerspace	Technology / System	Hackerspace	Benefit	3D printers ended up being one of those things everyone keeps coming back to. Everyone in a hackerspace has one, but it's more about the skills that you learn, the concept of employing your kids.
Entrepreneur	Technology / System	Entrepreneur	Benefit	We had a fantastic Facebook group. They had weekly awards and gave a lot back and a live ask-me-anything session every midday that it always had heaps of engagement.

5.2.15 Physical incubator space category

The category of physical incubator spaces includes physical spaces for individuals to engage in innovation activities. Roles include *Business enterprise centres*, *Coworking spaces*, *Creative hubs*, *Hackerspaces/makerspaces*, *Innovation hubs*, *Library's*, and *Men's sheds*. Example comments related to physical spaces are outlined in Table 5-16.

Business enterprise centres (BECs) were described as a type of incubator that provides physical space on a long-term basis, often in non-metro areas. *BECs* were described as a preceding model to innovation hubs and provide business support as part of their offering as well as

referral to other services. *BECs* were seen as an enabler in helping a community recognise the need for business support from other incubator models, while some respondents attributed the failure of the *BEC* as indicative of the potential failure of other incubator models, such as innovation hubs.

Coworking spaces were described as providing spaces for businesses starting out on a short-term or hot-desking format with some dedicated spaces. *Coworking spaces* focused on businesses that could operate from a desk, such as professional services and not just for technology companies. Example business support includes a reception or concierge service and facilitating events that support members, but without the dedicated entrepreneur support that is provided in an innovation hub. In regional communities the *Coworking space* was seen as a step up from local pubs and the library to support business activity and often operated as a spare room of a service provider or not-for-profit business support service. For businesses that could expand and scale, there was a need expressed to expand outside the *Coworking space* for additional support.

Creative hubs were described as distinct from a coworking space in that there was dedicated support for member projects but also different to an innovation hub in that there was not an emphasis on commercial outcomes from entrepreneurial endeavours. *Creative hub* functions included developing the region's art culture, digital skilling, and rental of the space as a venue leveraging creative functions, such as galleries. Management roles in the *Creative hub* could also provide creative direction and technical support. Like other physical spaces, *Creative hubs* operated as a space that allowed entrepreneurs to get out of the house and be in community. The de-emphasis on commercial outcomes was identified as attracting creatives and marginalised segments of the community for upskilling. More commercially-focused entrepreneurs who were in the space could also feel disconnected from a community of non-commercial creative artists without the presence of other entrepreneurs.

The role of the *Hackerspace/makerspace* was described as a space that offered technical equipment to support working on projects and businesses that required hardware or electronics. A main value of a *Hackerspace/makerspace* was having end-to-end support from design to build for rapid prototyping of physical products. The more commercially-focused the spaces, the less they required revenue from other sources, such as government funding. *Hackerspace/makerspaces* that were focused more on community outcomes or disadvantaged communities relied on philanthropic or government funding. *Hackerspace/makerspace* that

were community-run balanced imposing on members to work on projects and activities that supported the hub with members working on their own projects. Like many other incubators that relied on goodwill and volunteer support, leaders in *Hackerspace/makerspaces* experienced burnout from delivering programs without ongoing support. The need for financial support for specific physical space was greater in *Hackerspace/makerspaces* than other incubators due to the hardware and equipment requirements, requiring collaborations of a specific nature with TAFE or university and greater support from larger institutions, such as local government.

The role of the *Innovation hub* was described as a place where people could find like-minded people, get support including mentoring and technology access for business ideas, access lower costs for starting a business, access events and activities, and get a range of support. The *Innovation hub* supported entrepreneurs when and where they needed it, often available 24 hours a day, and had a common culture of giving back and helping others to overcome fear. The ownership structure of the *Innovation hub* was described as influencing the culture of the hub, with government hubs observed as having red tape and uncertainty related to changing political mandates. *Innovation hubs* provided activity through events and mentoring, but entrepreneurs also needed to focus on their businesses and could be overwhelmed by the volume of activities and events.

The role of *Library* provided functions in the innovation ecosystem of digital skilling and adding technical equipment, such as a makerspace with connections to schools. A benefit of *Libraries* was to engage with parts of the community that may not engage with the innovation hub due to preconceptions about technical skills required. *Libraries* were not described as providing entrepreneur support functions like innovation hubs, but innovation hubs were aware of what libraries offered so as to avoid competing with and replicating government-funded services in the region.

The role of *Men's sheds* was described as similar to a *Hackerspace/makerspace* but with less of an emphasis on new technology and electronics and a greater emphasis on community outcomes. References to *Men's sheds* were stereotyped as for an older audience with an emphasis on mental health support and as a place to go for less commercial outcomes than a more commercially focused hackerspace. *Men's sheds* were only mentioned by hackerspaces as an option for local referral.

Table 5-16 The role of Physical incubator space in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Entrepreneur advocacy group	Business enterprise centre	Startup ecosystem	Benefit	We had an enterprise centre for 20 years, but it ran out of energy the same time the idea of the innovation hub became important.
Chamber of commerce	Business enterprise centre	Startup ecosystem	Barrier	There was a previous business centre out of a 1990s model which originally started as a co-sharing space and gradually lost patronage a few years ago. They closed it down; the federal government pulled back the money for the person who used to manage it.
Coworking space	Coworking space	Entrepreneurs	Strategy	We have a diverse membership from lawyers, financial planners, stockbrokers, through to those in that data, digital IT space.
Coworking space	Coworking space	Established business	Strategy	Startups were getting all this support, and there wasn't a lot of support for business in general. We're not stepping away from the startup scene, but we're wanting to include more support for general regional business
Coworking space	Coworking space	Entrepreneurs	Benefit	If I can't help people or our business concierge out of reception, we facilitate those introductions so people can help other people. Our membership has grown because of that.
Entrepreneur	Local government	Coworking space	Barrier	I worked in a coworking space. It was run by Council and not resourced with social engagement.
Service provider	Coworking space	Entrepreneurs	Benefit	There is a need for having spaces in smaller communities. Not everything can be done at a pub or a cafe.
Economic development body	Coworking space	Entrepreneurs	Barrier	The coworking space is not really connected into the bigger network. There's a lot of startups there, but they are lacking an ability to grow, to be connected into getting an understanding of the problem statement that industry is putting forward then to drive that innovation with enough scale to hit that matter in a timely enough fashion.
Creative hub	Creative hub	Entrepreneurs	Vision	Success for us will be about focusing on the things that we do well: education, arts exposure, performing arts, static arts, arts workers, and our educational program.
Creative hub	Creative hub	Local government	Benefit	We don't tend to charge for full gallery events. We rent that out. We've got the council coming tomorrow to have an economic development meeting upstairs.
Creative hub	Technology / System	Creative hub	Benefit	We have a live streaming and recording facility that gives individuals and businesses the opportunity to make professional quality videos and podcasts.
Entrepreneur	Creative hub	Entrepreneur	Benefit	This place gets me out of home and I'm able to meet some other people. The region is a really small gene pool so if I wasn't here I'd probably be working at home.

Interviewee	Described from role	Acting on role	Relationship type	Quote
Entrepreneur	Hackerspace	Entrepreneur	Benefit	The development from CAD to CAM to machining and then iterations really gets condensed in this space and makes a project move a lot faster, makes it achievable, we test it quickly.
Hackerspace	Hackerspace	Entrepreneur	Benefit	If I see someone who is socially disadvantaged, this gives them an outlet to escape that and pursue something that they're passionate about for their own sake.
Hackerspace	Hackerspace	Entrepreneur	Barrier	Hackerspaces have that atmosphere when you come, and you just work on your thing. You're not supposed to be too concerned about what's good for the space.
Hackerspace	Hackerspace	Ecosystem leader	Barrier	We did introduction to Arduino and basic electronics, put on free coding workshops on the weekend for three terms, and then took a break because we were burned out.
Local government	Local government	Hackerspace	Strategy	We've identified some buildings, and we've been going through a fairly tortuous process of attempting to get that off the ground with TAFE.
Innovation hub	Innovation hub	Entrepreneur	Benefit	Anyone can work from a desk, but we're about more than that. It's about understanding what that person needs and helping them to find what it is that they're looking for.
Entrepreneur	Innovation hub	Entrepreneur	Benefit	It doesn't matter if it's 10:00 at night or 4:00 in the morning, there is always somewhere to go and brainstorm ideas or find a quiet place to work or find other people that are interested in the same thing
Entrepreneur	Innovation hub	Industry and technology community	Benefit	They're all likeminded individuals that want to give back as well as take. To benefit, you don't always have to be receiving.
Mentor	Innovation hub	Community	Benefit	The hub would be a place where people are not afraid to see something that's a little bit different. It's a facilitation place, a place that's beautiful, that awesome saying that these places are a collision space.
Hackerspace	Innovation hub	Startup ecosystem	Barrier	The innovation hub, the red tape gets in the way of the action and that whole entrepreneurial way of going forward and not knowing what the outcome is going to be. They are stifled.
Entrepreneur	Innovation hub	Entrepreneur	Barrier	You probably get too much information at some point. You have to step back and go 'Okay, I can't attend everything. I can't do all the workshops. I can't do all the 'lunch and learns'. I wouldn't get anything done.'
Local government	Library	High schools	Benefit	A library runs digital workshops. There's a stem hub program. We've been attending those meetings. We're working with the schools.

Interviewee	Described from role	Acting on role	Relationship type	Quote
Peak body / Industry association	Library	Community	Benefit	You can still take out media or books or connect to the Wi-Fi, but there are additional services like the concept of the makerplace. Now we experiment with some of the new technologies, the concept of acquiring new skills, and maybe the people who are acquiring skills are those people that are perhaps on the edge of our communities.
Innovation hub	Library	Education program	Benefit	The library already does all the coder dojo and all those basic coding, so we don't want to duplicate any of that.
Hackerspace	Men's shed	Entrepreneurs	Benefit	Men's shed's tend to focus on a particular demographic which is 50 plus, tend to be retirees, men, and a large focus on improving mental health by giving you a set of tools to work through mental problems by being active.
Hackerspace	Men's shed	Entrepreneurs	Benefit	If the project is wrong or if the member has got the wrong outcomes in mind, we are not the space for you. You need to go to the men's shed because they will be better suited to what you're after compared to being a professional home for makers.

5.2.16 Policy category

The category of policy included the single role of *Policy* and was used to capture references to place-based strategy and legislation (Table 5-17). *Policy* was frequently attributed as a function of government and associated with the function of advocacy to influence a change in policy. Other related concepts included strategy, strategic position, and prioritisation framework. The role of *Policy* is listed as distinct from the government roles as *Policy* was referred to as a separate role that also interacted with peak bodies and other groups that advocated for policy change. Other roles interacted with *Policy* through accessing grants, funds, and programs defined by specific policy, or to align programs to support future policy. *Policy* was described as something to influence for long-term change even by those not directly associated with advocacy, such as innovation hubs or ecosystem leaders.

Table 5-17 The role of Policy in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Local government	Local government	Policy	Vision	We have a prioritization framework that is not rigid, but supports strategic decisions. In a community of 300,000 people over 2,000 square kilometres and a ‘village of villages’, everyone's idea is important.
Economic development body	Policy	Geographic regions	Benefit	We've got a list of eight infrastructure priorities and policy priorities in the region that we advocate to the state and federal government.
Creative hub	Creative hub	Policy	Benefit	I bought all the equipment. It was funded by the council as a pilot. In putting the grant together, we addressed outcomes they wanted to deliver in their youth policy.
Peak body / Industry association	Policy	Innovation hub	Benefit	A consistent policy around innovation, eco hubs, cluster development is the catalyst for driving economic development. Let's get that into policy, get some consistent resourcing, and build the capacity of the people responsible for the output and build our competitiveness.

5.2.17 Sector category

The Sector category includes roles of industry sectors, with *Tourism*, *Agriculture*, and *Mining* highlighted in the interviews (Table 5-18). Sector roles are often represented by economic development organisations or industry associations, but respondents referred to the sector as an actor on its own exclusive of the representative body. The sector was considered as an enabler and inhibitor of other roles, including other sectors.

Tourism was common across regions whether the region had an agriculture or resources focus. Innovation and entrepreneurial activity acted as a form of ‘innovation tourism’, with award programs and successful entrepreneurs raising the region’s profile and innovation events such as hackathons and accelerators attracting mentors, sponsors, and entrepreneurs to the region. Respondents expressed the need for a collaborative approach within the *Tourism* sector and potentially linking tourism operators with innovation activity to bring tourism operators and entrepreneurs together to leverage shared resources.

Agriculture played a dominant role in regional areas and was referenced in relation to the innovation ecosystem as agriculture technology or ‘AgTech’ connected farms. Local chambers of commerce developed programs specific to agricultural members and communities, and local governments developed innovation hubs focused on AgTech. Established farms had access to

technology, but innovation hubs provided efficiency in technology curation and access to information related to new technologies and markets.

While a significant sector in some regions, *Mining* was not prominent in all regions. Where there was a local strength in the *Mining* sector, it attracted entrepreneurs to the region. The transition from the ‘mining boom’ to focus on operational efficiencies and access to large corporate procurement was seen as a challenge. The *Mining* sector participated in external programs, such as hackathons, but was also viewed as risk-averse and slow to integrate new external innovations into operational activities.

Table 5-18 Sectors in the innovation ecosystem

Interviewee	Described from role	Acting on role	Relationship type	Quote
Chamber of commerce	Entrepreneurs	Tourism	Benefit	Because a lot of these operators and farmers and tourism, food tourism operators have been operating in their sector and the industry for generations.
State government	Geographic region	Tourism	Benefit	Strengths in the region is that link with the reef and maybe tourism.
Entrepreneur	Tourism	Entrepreneur	Benefit	Tourism is a very asset-intensive industry like mining. If there was a forum to bring those big operators together with startups like me, that would be hugely advantageous.
Chamber of commerce	Agriculture	Community	Benefit	We're a town based on agriculture. If there was no agriculture in the area, we wouldn't have a town.
Industry association / Peak body	Technology / Systems	Agriculture	Benefit	In terms of the Ag Tech service space, there'll be more that's happening there, whether it's sensors for farms, drones, or modifications to equipment. With that brings people that have got a level of skill in engineering and design.
Entrepreneur	Mining	Geographic region	Benefit	For my startup, I've kind of realized being in this region isn't the ideal spot. There isn't a lot of support in creating relationships with heavy industry.
Entrepreneur advocacy body	Startup ecosystem	Mining	Barrier	Where the rubber hits the road in mining is anti-innovation. It's seen as a danger to people in production systems because this is the operational side.

5.3 Functions in the innovation ecosystem

Functions in the ecosystem emerged as interviewees described how roles and actors interact with other roles and actors. These interactions were previously described in Section 3.8 and outlined in Figure 3-3. Each interaction was coded as an enabling benefit or success, as an inhibiting barrier or challenge, as a vision of the future, or a strategy to realise the vision.

Through the coding process, twenty-one second order codes were defined as functions from 200 first-order codes against strategy statements. These functions are not intended to be definitive of all functions in the innovation ecosystem, but to provide a framework to consider the types of functions performed.

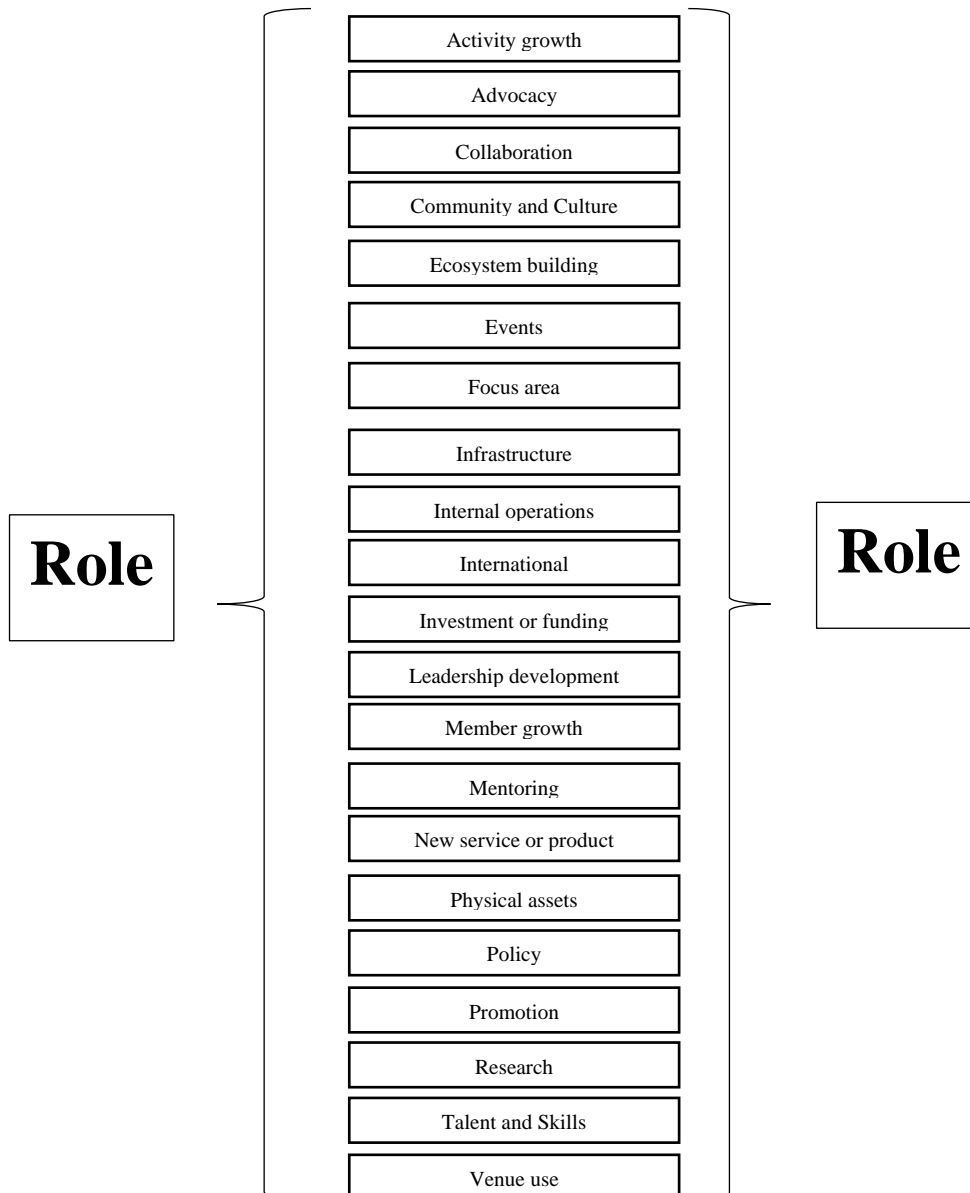


Figure 5-4 Functions performed by roles in the innovation ecosystem

- **Activity growth:** Increase the quantity and intensity of the activity, including increasing the number of events and expanding services to a wider audience and new audience groups.

- **Advocacy:** Actors representing the interests of themselves or other actors, including entrepreneurs, specific technology groups, and the broader innovation community. The advocacy function lobbied government on key issues of the community, such as infrastructure, and was also performed by local governments advocating to other levels of government and the broader community.
- **Collaboration:** Collaboration was a dominant and diverse function identified in the interview data, grouped into four inter-related aspects: (1) leadership and culture around developing clusters, developing a shared vision, and fostering collaboration among local stakeholders; (2) specific partnerships (e.g., corporate, government, or university partnerships) and their functions including cross-promotion of activities or sharing resources; (3) modifying services or products of individual actors to align strategies across roles and actors; and (4) changing the structure and resourcing models of actors, such as developing centralised admin or regional support resources.
- **Community and Culture:** Activities that impact the overall community's perceptions and way of working and influencing perceptions towards innovation and entrepreneurship. A distinction was raised between the internal culture of the hubs, the culture of the startup ecosystem, and the culture of the surrounding community, a distinction between collaborative and competitive cultures, and a need to develop inclusive language between the local community and the startup ecosystem.
- **Ecosystem building:** Activities focused on creating the system that supports innovation and entrepreneurial activity. This can include developing the capability and capacity in a specific area, such as property development or high schools, as well as developing the collaborative networks in the region overall and identifying opportunities for competitive tensions.
- **Events:** Activities related to organising and running events, bringing people together for workshops, leader panels, and presentations.
- **Focus area:** Directing efforts towards an industry sector (e.g., agriculture, mining), community segment (e.g., female, indigenous, youth), or technology segment (creative technologies, artificial intelligence). The focus could also be on strategic opportunities, such as encouraging retired entrepreneurs to participate or aligning the focus with the government policy or strategy.
- **Schools / Youth (Focus area):** A highlighted focus area based on the dominant reference compared to other possible focus areas, such as female entrepreneurship or

industry sector. Activities focused on youth and schools to mitigate youth populations leaving the regions, attract youth to the regions, and invest in future talent capability.

- **Infrastructure:** The implementation of infrastructure, including roads, airports, and internet connectivity. Expressed as both individual projects on specific aspects of infrastructure (e.g., roads, internet), as well as major cross-regional projects.
- **Internal operations:** Activities by an organisation to sustain or expand its own services, improve the quality of its services, or repurpose internal assets. Examples include changing organisational structures, changing payment structures, and adding or removing staff.
- **International:** Activities related to accessing markets outside of Australia, usually to support local entrepreneurs to export goods or services.
- **Investment or funding:** The allocation of financial capital from one role to another role, including funding to sustain and grow the organisation or to support member businesses. Sources include government, corporates, philanthropy, and private investment.
- **Leadership development:** The development of leaders to support outcomes for innovation and entrepreneurial activity. Examples include the need to identify and create leaders, introduce innovative leaders to traditional advisory board structures, leaders to provide introductions to broader networks, develop and create structures for local champions, get institutional leaders on board, and build capability in established leaders government or corporate roles through education and the development of a long-term vision. The type of leadership was also noted, with a ‘give back’ attitude, charismatic as well as humble.
- **Member growth:** Activities related to supporting the growth of businesses that were members of roles, such as innovation hubs, coworking spaces, peak bodies, economic development bodies, and technology communities. Common to the roles is the concept of advancing or ‘moving on’ members, with the roles of innovation hubs and coworking spaces seen as a temporary support for a point in time of the business journey rather than a need to ‘hold on’ to entrepreneurs.
- **Mentoring:** Mentors provided a range of support, including: acting as boundary spanners between industry sectors, geographic regions, and technology communities; providing expertise in a given field; introductions to new ideas and technology; providing examples of successful businesses; accountability for business leaders; and

emotional support for business leaders. Mentors are provided through legitimate roles, such as entrepreneurs-in-residence or creatives-in-residence, are provided as a panel of mentors to add value to incubators, and *ad hoc* through interacting with other members.

- **New service or product:** The development of new offerings by organisations. Examples include developing follow-on programs (e.g., export-readiness programs), developing service as a product (e.g., concierge service for coworking), adapting established programs (e.g., university courses to incorporate entrepreneurial thinking), adding new programs (e.g., hackathons or accelerators), increasing the local product offering (e.g., increasing the number of programs), and offering virtual memberships.
- **Physical assets:** The development of new buildings or expansion or redevelopment of existing buildings. These functions were performed to improve the external aesthetics and therefore community presence, offer additional services to businesses, and position the organisation for additional funding or revenue.
- **Policy:** Legislation or regulation developed by local, state, and federal government. Examples included policy for innovation, supportive of or restrictive towards entrepreneurs or small business, and enabling decisions around infrastructure.
- **Promotion:** Sharing information about actors and activity in the innovation ecosystem through media and networks, including promoting the region to attract the different roles, promoting specific industry sectors, promoting entrepreneurs, and soliciting support for entrepreneurial activity through policy and activities.
- **Research:** Gathering of data and distribution of information and reports on the ecosystem itself, for individual entrepreneurs, for industry sectors, and individual businesses. Examples include research for the ecosystem performed by local governments exploring ways to support innovation and entrepreneur activity such as activity and role mapping exercises, by peak bodies and ecosystem leaders seeking to advocate for government support, by businesses and entrepreneurs for their own businesses, by universities and research collaborative bodies, and by ecosystem leaders as a check-and-balance on established government research and support.
- **Talent and Skills:** Attracting, developing, and retaining skills and capability in regions. Applied for established businesses, specialised knowledge workers focusing on technology, and providers of ecosystem support services.

- **Venue use:** Use of the physical venue for events and for working, seen as an alternative to working from home and work with like-minded people and related to the events function as a venue to host events, as well as for others to hire the venue for events.

5.4 The role and functions of an innovation hub in the innovation ecosystem

Roles and functions in the innovation ecosystem were identified from the interviews, as outlined in Section 5.2 and 5.3. Section 5.4 addresses RQ1 “*What is the role of the innovation hub in an innovation ecosystem?*”. The Section aims to identify the functions of the innovation hub, which functions were shared by other roles, and which functions were performed in relation to other roles, thereby answering RQ1.

The assessment is performed by counting the instances where the function was identified for different roles in the interviews. An ‘instance’ is counted when an interviewee referenced the function being performed by a role as it interacted with another role. Table 5-3 shows instances of functions against innovation ecosystem roles identified and coded from interviews.

It is worth reiterating the point made in Section 3.8 about counting the number of codes. Counting codes demonstrates a systematic approach to qualitative research and a useful indicator for the importance of a given code (Elliot, 2018) but not a quantitative orientation of magnitude and frequency (Creswell, 2013). The grouping by number of instances is provided as an observation to consider how functions might be grouped as an assessment of the importance for the role of the innovation hub. Other inferences from counts, such as the extent a function, is performed by an innovation hub or quantitative comparisons of functions by roles are problematic given the qualitative nature of the research.

Some considerations must be kept in mind when reviewing the data. First, the emphasis of the interviews was on the roles of the innovation hub. As such, the results in Table 5-19 are not representative of all functions performed by other roles in the innovation ecosystem. Functions identified for roles apart from the innovation hub are captured as a matter of convenience in the sample. Second, the number of instances is not a reflection of the extent that the function is performed by a given role in the ecosystem. Four instances of collaboration for local government is not an assessment of the extent that local government is collaborative, but the number of times the function was coded through the interview process. The results should be used to reflect the emphasis placed on the function by the interviewee rather than the extent that the role performs the function. Third, the absence of a function for the role is reflective of the function not being raised in the interview, not the absence of the function not being

performed by the role. The role may still perform the function, but the function may not have been raised as relevant in the discussion. The interview process did not test for the absence of a function.

Table 5-19 Functions related to innovation ecosystem roles

Contributing role	Instances of functions identified and coded from interviews																					
	Core								Internal						External influence				External concern			
	Collaboration	Venue use	Events	Promotion	Focus area	Member growth	Mentoring	Schools / Youth	Activity growth	Investment or funding	Internal operations	Leadership development	New service or product	Physical assets	Advocacy	Community and Culture	Talent and Skills	Ecosystem building	Infrastructure	International	Policy	Research
Accelerator - Incubator program	2			1	1	3	2	2	2	1	1	1	2				1					
Advisory												2				1						1
Advocacy / Education / and Support organisations	5		5	3	1		1	1	1	2	1	1			3		1	7				
Chamber of Commerce	2		4	1					1						2	1						
Community				1												1						
Coworking space	4	2	3		1				1	1	1		3			1		1				1
Creative hub	2			1		1		1			2	1	1	1		1	1					
Economic Development Body			2	1	1		1				1	2	1		1	1			2		1	
Ecosystem leader	2		3		1		4		1		2	6	1		1	2	1	2				1
Education - other providers																	2					
Education program				1			1															
Employee				1																		
Entrepreneurs	1	3			1	2	1			2	2	2	2				1				1	
Financial capital - Angel investment	2											1										
Financial capital - Government funding										1												
Geographic region	1									1			1				1					
Government - Federal										1												1
Government - Local	4		5	4	4	2			1	4	3	1	3		2	3	1	1	2		1	2
Government - State									1	2	1										1	
Hackerspace Makerspace	2	2		1		2	1			3	3		2									
High schools	1				1		1	1		1	1	1					2	1				
Industry and technology communities	1						1						2									
Industry association and peak body	2				2		1					1									1	
Innovation hub	10	9	8	7	6	6	6	6	5	5	4	4	4	4	3	3	3	1				
Large corporations and multinationals										1							1					
Library		1						1									1					
Startup ecosystem	1							2		2	1	2				1						
Technology / System													1									
Universities	2				1				1	1	1	1	1			1	2	1			1	1

The functions identified in the interviews are grouped and sorted into four categories based on the number of instances raised for innovation hubs. These categories include Core, Internal, External influence, and External concern (Figure 5-5).

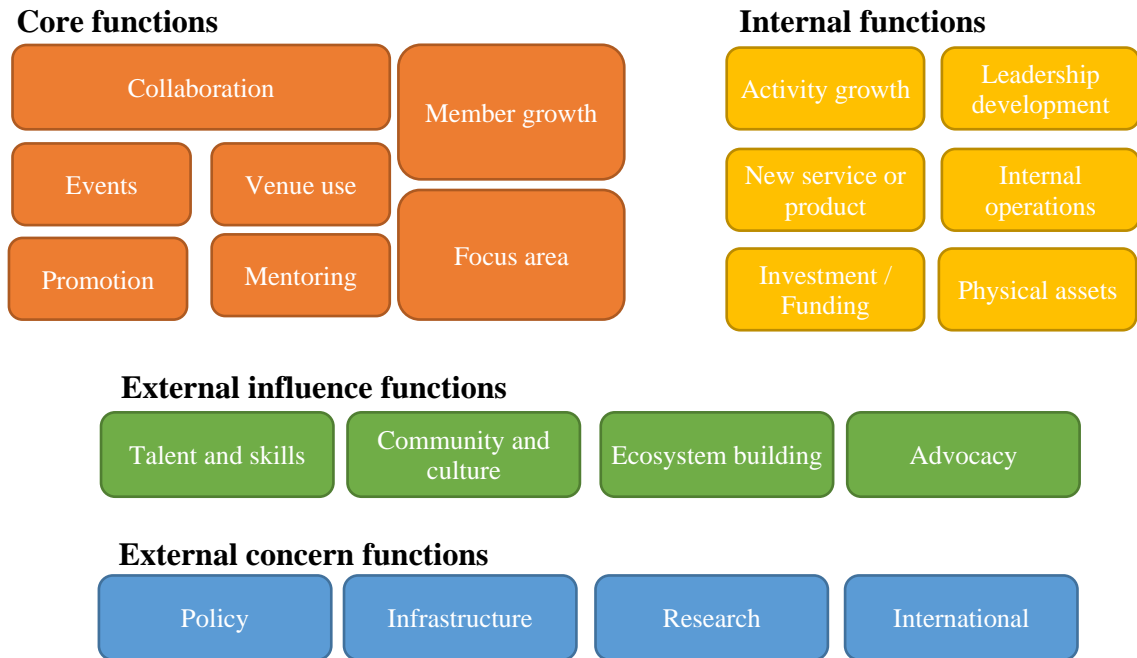


Figure 5-5 Innovation hub functions

Social network analysis was conducted on the data to consider functions that were unique to the innovation hub and that distinguishes the hub from other roles, as well as where there were shared functions that might create opportunities for collaboration as well as competitive tension. The network map of roles and functions in Figure 5-6 visually represents the data from Table 5-19, showing functions shared by different roles.

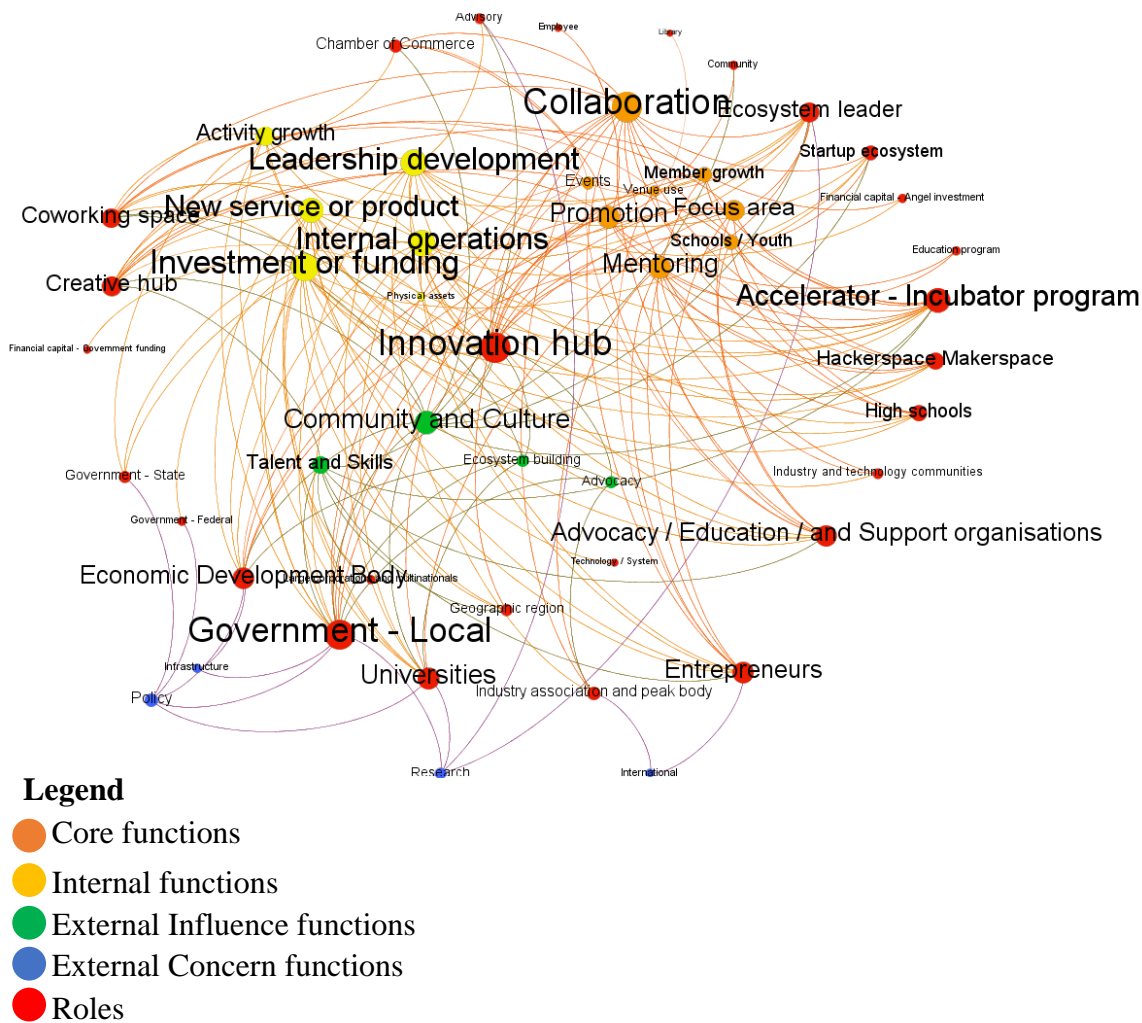


Figure 5-6 Network map of innovation ecosystem roles and functions

Functions in the Core category were seen as essential to the delivery of innovation hub outcomes and were associated with revenue generation. These functions include collaboration, promotion, member growth, mentoring, and focus areas, including student and youth. These functions reflect the primary functions of the innovation hub in supporting individuals to build, grow, and scale their business and working with the local community and wider network to achieve this outcome.

The Core functions also reflect where other roles identify value from the innovation hub. Collaboration functions were core to achieving outcomes for entrepreneur members and connecting them to other roles. Promotion supported both the entrepreneur members, as well as the hub through association with the member outcomes. The focus area functions, including the function of ‘schools and youth’, reflected a pursuit of sectors (e.g., agriculture, mining), communities (e.g., female, indigenous), or other challenges important to the region that could also be associated with targeted funding opportunities. Member growth functions correlate to

the sustainability and success of the innovation hub. Finally, mentoring is the main engagement with member entrepreneurs and businesses.

The Internal category of functions includes activity growth, investment or funding, new service or product, internal operation, and leadership development. These functions can be seen as necessary to build capacity and capability in the innovation hub but not directly tied to revenue generation potential. Internal functions may be necessary for effective and sustainable delivery of the Core functions.

The Activity growth function includes increasing the number of events, programs, or participants. The function was reflected as a measure of output necessary to achieve member growth. The investment or funding functions included accessing financing for the innovation hub, as well as providing connections to funding to hub members. The development of new products and services were necessary to access new funding opportunities, support members as their businesses grew, and access new member groups. Functions related to internal operations (e.g., staffing, operational efficiencies) supported the effective delivery of Core functions. Finally, leadership development functions build capability in leaders in the hub and the community.

The third category of External Influence functions includes community and culture, talent and skills, advocacy, and ecosystem building. These functions focus on the external environment where the innovation hub has more influence and support for the development of the overall ecosystem. The functions are not part of the Core or Internal functions of the innovation hub but are essential to cultivating the environment in which the hub operates. These functions include the innovation hub taking an active role in developing the local community and culture, cultivating talent and skills, advocating to government and community leaders, and overall development and building of the innovation ecosystem. These functions require additional resources outside of functions involved in core functions of the hub.

Interviewees did not reference the fourth External concern category of functions as being performed directly by the innovation hub. The External concern category includes the four functions of infrastructure, international, policy, and research. Functions in this category could be seen as influencing and integrating with the innovation hub, but also requiring greater collaboration to perform the function. For example, the infrastructure of transport and internet connectivity were deemed essential to the operation of the innovation hub, but were the primary focus of other roles such as government or economic development bodies. International

functions were necessary for overseas expansions and access to global markets, but the early-stage focus of the innovation hubs meant that this function was left to the entrepreneurs themselves or through peak bodies. Functions related to policy directly influenced innovation hubs through innovation and entrepreneur-related funding and programs but involved all three levels of government and economic development bodies. The function of research was performed by universities, local governments, ecosystem leaders, and advisory groups, such as boards that supported the innovation hubs.

The respondents described Core functions of the innovation hub as working with others to develop and promote entrepreneur and startup. Internal functions focused more on the sustainability and further development of the hub itself but similar functions were performed in other roles. External influence functions related to areas where the hub had direct influence working with other roles to develop the external environment to benefit members and entrepreneurship. Finally, External concern functions were not identified as being performed by the innovation hub but impacted on the innovation hub and were the primary responsibility of other roles.

5.5 Conclusion

Chapter 5 has addressed RQ1 by identifying the role of the innovation hub in the innovation ecosystem. This was achieved by first identifying the roles in the innovation ecosystem that emerged from the interviews, and then identifying the functions described as being performed by actors through interactions with a focus on innovation hubs. The functions of the innovation hub were then grouped into four categories based on frequency of instances of the function being identified: Core, Internal, External influence, and External concern. The role of the innovation hub in the innovation ecosystem was established based on the shared and unique functions performed in relation to other ecosystem roles. The description of the innovation hub roles is not normative, and no attempt has been made to describe what the innovation hub should or should not do. Instead, this analysis simply describes the corroborative reality of the collective narratives from the interviews.

The main role of the innovation hub in the innovation ecosystem is to support member innovators and entrepreneurs to advance their businesses and projects. This function is considered core to the hub operations, is often focused on a specific outcome, and is achieved through events, use of physical space, mentoring, and promoting member outcomes. The delivery of these services requires significant collaboration with other roles in the innovation

ecosystem. To achieve these outcomes, the hub performs other internal functions, such as growing activity, developing leaders, creating new services and products, securing funding, and developing physical assets. The innovation hub also performs functions with other roles to support local outcomes, including building the local ecosystem, advocating for entrepreneurs and innovation, developing community and culture, and attracting and developing talent and skills. Finally, there are functions that are a concern to the innovation hub, but for which it may have little active participation. These functions include developing policy, conducting research, developing infrastructure, and establishing international connections.

The role of the innovation hub in the innovation ecosystem has been described in this research from literature, observed in the Australian context, and identified from interviews. Building on this foundation of establishing the innovation hub's role, Chapter 6 will explore how the innovation ecosystem contributes towards community resilience. Chapter 7 will continue to describe the contribution of the role of the innovation hub on the innovation ecosystem.

CHAPTER 6: RESULTS – CONTRIBUTION OF THE INNOVATION ECOSYSTEM TOWARDS COMMUNITY RESILIENCE

6.1 Introduction

Chapter 6 continues the presentation of the results with a focus on RQ2: “How do innovation ecosystems contribute towards community resilience, and what are the enabling and inhibiting contributions?” (Figure 6-1). The overview in Section 6.2 summarises enabling and inhibiting contributions by innovation ecosystem to community resilience. Section 6.3 includes a social network analysis of the enabling and inhibiting contributions for each of the 19 community resilience subdimensions, including excerpts of narratives to support the results. Section 6.4 aggregates the results by subdimension for the innovation ecosystem, before Section 6.5 concludes the chapter.

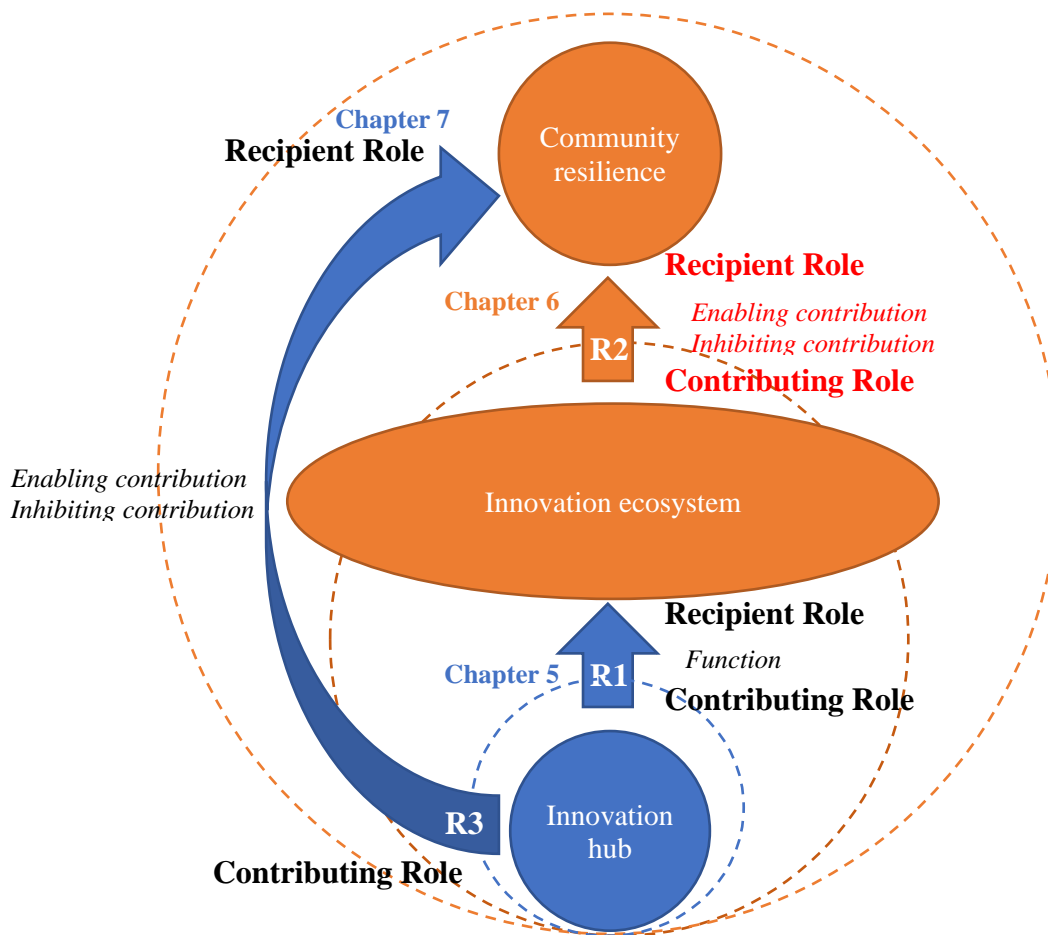


Figure 6-1 Research question address by Chapter 6 – The contributing role of the innovation ecosystem on community resilience

6.2 Overview of the results

Interviews were coded to determine the roles and actors being described to assess the contribution of the innovation ecosystem towards community resilience. Codes were applied based on whether the context was perceived as an enabling or inhibiting contribution by the interviewee, and which indicators of community resilience might be impacted based on the interview comments. Each coding instance included the interviewee role and actor, the contributing role and actor, and the recipient role and actor as described by the interviewee.

As mentioned in Section 3.8, counting codes demonstrates a systematic approach to the qualitative research and a useful indicator for the importance of a given code (Elliot, 2018). The total number of codes should not, however, be considered a quantitative orientation of magnitude and frequency of the contribution towards community resilience (Creswell, 2013). The grouping by percentage enabling and inhibiting contribution and by role or community resilience dimension is provided for context of the qualitative results. A quantitative assessment of the dominance or lack of a role or dimension is not an accurate or reliable finding from this research.

The 147 interviews were coded with a total of 2,046 code instances, including 1,276 enabling instances and 770 inhibiting instances. One-third of the codes (33.2 per cent) related to the innovation hub given its centrality to the focus of the research. The next most prominent codes were assigned to the roles of Local government (6.2 per cent) and Chamber of commerce (5.0 per cent). Subsequent frequency of coding attributed less than 4 per cent of the total number of codes to any given role. When considering the balance between enabling and inhibiting contributions, a greater number of enabling contributions were recorded (62 per cent) over inhibiting contributions. This was influenced by the appreciative inquiry nature of the questioning focusing on strengths and benefits in the relationships. A breakdown of the enabling and inhibiting contributions by innovation ecosystem role is shown in Table 6-1.

Table 6-1 Coding instances of enabling and inhibiting contribution by innovation ecosystem role

Role	Enabling contribution	Inhibiting contribution	Total	Pct of total	Pct Enabling
Hackathon Programs	47	0	47	2.3%	100%
Library	28	0	28	1.4%	100%
Industry and technology communities	18	0	18	0.9%	100%
Education - other providers	15	0	15	0.7%	100%
Award programs	7	0	7	0.3%	100%
Established business	12	0	12	0.6%	100%
Local retail	4	0	4	0.2%	100%
Hackerspace Makerspace	63	4	67	3.3%	94%
Education program	65	7	72	3.5%	90%
High schools	11	2	13	0.6%	85%
Technology / System	16	3	19	0.9%	84%
Government - State	48	10	58	2.8%	83%
Economic Development Body	28	11	39	1.9%	72%
Accelerator - Incubator program	44	19	63	3.1%	70%
Ecosystem leader	49	24	73	3.6%	67%
Events	22	11	33	1.6%	67%
Chamber of Commerce	68	35	103	5.0%	66%
Financial capital - Angel investment	29	15	44	2.2%	66%
Industry association and peak body	20	11	31	1.5%	65%
Startup ecosystem	42	27	69	3.4%	61%
Financial capital - Government funding	16	11	27	1.3%	59%
Advocacy / Education / and Support organisations	17	12	29	1.4%	59%
Service provider	25	18	43	2.1%	58%
Innovation hub	391	289	680	33.2%	58%
Media	5	4	9	0.4%	56%
Entrepreneurs	41	35	76	3.7%	54%
Government - Local	67	60	127	6.2%	53%
Government - Federal	16	24	40	2.0%	40%
Universities	20	30	50	2.4%	40%
Coworking space	10	16	26	1.3%	38%
Community	8	14	22	1.1%	36%
Business Enterprise Centre	2	4	6	0.3%	33%
Large corporations and multinationals	12	29	41	2.0%	29%
Geographic region	8	32	40	2.0%	20%
Culture	2	13	15	0.7%	13%
Total	1276	770	2046		62%

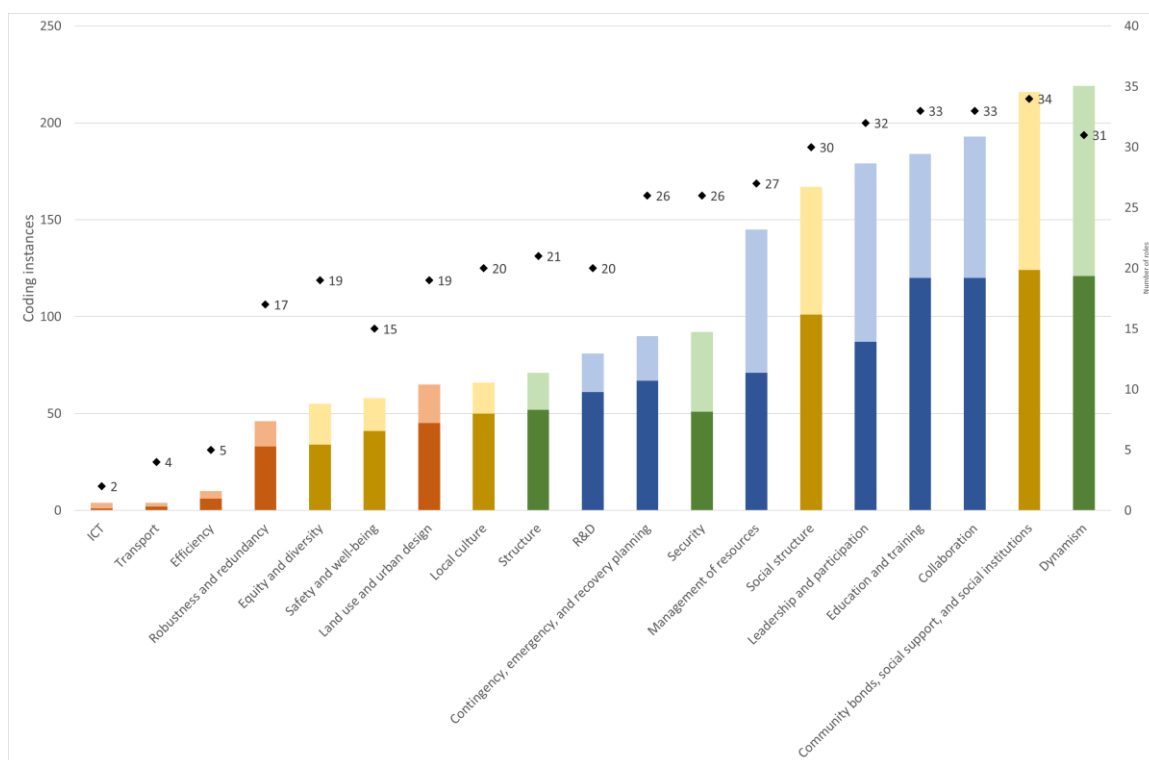
Of the codes attributed to community resilience dimensions, almost half (45 per cent) were attributed to the Institutional dimension, followed by the Social and individual (29 per cent), Economic (20 per cent) and the Built environment / Infrastructure (7 per cent) dimensions (Table 6-2). Enabling contributions ranged from a low of 58 per cent of the total code instances for the Economic dimension to a high of 68 per cent enabling contributions coded for the Built environment / Infrastructure dimension. Individual subdimensions ranged from 49 per cent enabling contributions for *Management of resources* and *Leadership and participation*

subdimensions of the Institutional dimension to 75 per cent enabling contributions for the *R&D* subdimension of the Institutional dimension and the *Local culture* subdimension of the Social and individual dimension.

Table 6-2 Coding instances of enabling and inhibiting contribution by the innovation ecosystem towards community resilience subdimensions

Dimension	Subdimension	Enabling contribution	Inhibiting contribution	Total	Number of roles	Pct of dimension total	Pct Enabling	Total	Pct of total	Pct Enabling
Built environment / Infrastructure	ICT	1	3	4	2	3%	25%			
	Transport	2	2	4	4	3%	50%			
	Efficiency	6	4	10	5	8%	60%			
	Robustness and redundancy	33	13	46	17	36%	72%			
	Land use and urban design	45	20	65	19	50%	69%	129	7%	67%
Economic	Structure	52	19	71	21	19%	73%			
	Security	51	41	92	26	24%	55%			
	Dynamism	121	98	219	31	57%	55%	382	20%	59%
Institutional	R&D	61	20	81	20	9%	75%			
	Contingency, emergency, and recovery planning	64	23	87	26	10%	74%			
	Management of resources	71	74	145	27	17%	49%			
	Leadership and participation	87	92	179	32	21%	49%			
	Education and training	120	64	184	33	21%	65%			
	Collaboration	120	73	193	33	22%	62%	869	45%	60%
Social and individual	Equity and diversity	34	21	55	19	10%	62%			
	Safety and well-being	41	17	58	15	10%	71%			
	Local culture	50	16	66	20	12%	76%			
	Social structure	101	66	167	30	30%	60%			
	Community bonds, social support, and social institutions	124	92	216	34	38%	57%	562	29%	62%

The subdimensions with the highest number of codes were the Economic subdimension of Dynamism and the Social and individual subdimension of Community bonds, social support, and social institutions. The lowest number of codes were associated with the Built environment / Infrastructure subdimensions of ICT, Transport, and Efficiency. Lower instances of codes in the infrastructure dimension were expectedly associated with a small number of roles, while instances of codes for the remaining subdimensions were associated with over 15 different innovation ecosystem roles (Figure 6-2).












LEGEND	Contributions	
	Enabling	Inhibiting
Built environment / Infrastructure subdimensions		
Economic subdimensions		
Institutional subdimensions		
Social and individual subdimensions		
Number of contributing roles		

Figure 6-2 Coding instances of enabling and inhibiting contribution by the innovation ecosystem on community resilience subdimension

Table 6-3 provides a summary of the contribution of each innovation ecosystem role as an enabling or inhibiting contribution to community resilience. However, the innovation ecosystem is complex, and the table does not capture the network of relationships involved in each dimension. Section 6.3 uses social network analysis to depict the relationships between roles in the context of each subdimension and incorporate qualitative data to understand the innovation ecosystem’s contribution to community resilience.

Table 6-3 Contribution of innovation ecosystem roles to community resilience

Contribution -->	Built environment / Infrastructure												Economic						Institutional										Social and individual																
	Efficiency			ICT			Land use and urban design		Robustness and redundancy		Transport		Dynamism		Security		Structure		Collaboration		Contingency, emergency, and recovery planning		Education and training		Leadership and participation		Management of resources		R&D		Community bonds, social support, and social institutions		Equity and diversity		Local culture		Safety and well-being		Social structure						
	+	-		+	-		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-					
Accelerator - Incubator program	44	19						1						5	3	1	1		1	5	2	2	1	5	2	3	2	1	4			5		1	1			5		5	2				
Advocacy / Education / and Support organisations	17	12												2					2	2	1	1	2	1	1	2			2			2	2						1						
Award programs	7	0												1					1				1									1							1						
Business Enterprise Centre	2	4												1									1			1																			
Chamber of Commerce	68	35												8	7	4			1	7	6	5	1	5	4	5	4	3	1	5	1	6	6			1	1			5	3				
Community	8	14												1	3		1		1	1	1		1	1	1	1			1	3			1	1	1	2	1	1	1						
Coworking space	10	16						2	1					2	3	1	2		1	1	2				1					1			1								1				
Culture	2	13																		2				2			2			1	2			1	2										
Economic Development Body	27	11	3	1				1						2	1	3			3	2	3		2	1	3	3			2	2			1												
Ecosystem leader	49	24						1						4	3	1	2	2		4	2	1		3	3	6	3	5	3	1	1	6	3			1	2			2	1	3	2		
Education - other providers	15	0						1						1					1				1		1		1					1			1					1					
Education program	65	7						4						6		1	1	4		5	1		1	6		4	2	4			1	5	1	6	5			7		4					
Entrepreneurs	41	35						2						3	4		2	4	5	4	3	1		4	5	3		2	2	2		4	4	3	3	2			1	2	3	3			
Established business	12	0												2		1				1				1		1		1					2								1				
Events	22	11												3					3	2	2		4	2	1		2	1	3		4	2									2				
Financial capital - Angel investment	29	15												5	4		1		4	1	4		1	5			1	3	2	3		2	2							1	3	2			
Financial capital - Government funding	16	11												2	2	3	1	1		2	1		1	2	1	1	2	1		2	1	1	1	1											
Geographic region	8	32						3						2	2	1	3		4				4	1				2		1	1	2			2	1						4			
Government - Federal	16	24			1									1	5	4	5	4					1	1	1	1	5		3	1		1			1			1			2	2			
Government - Local	66	60	3		1			4	2	2	1			5	11	2	2	3	1	4	4	3	2	6	5	9	13	3	2	4		5	12					4	3			1	1		
Government - State	48	10			1			1						1	9	2	13	1		5			2	3	7	2	1	2	5		1											1	1		
Hackathon Programs	47	0						2						4		1		2		3			2	4		4		3		2		5			4			2		3		4			
Hackerspace Makerspace	63	4						2						3		1	1	6		6			1	6		2	1	6		6		5	1	4	3			2	1	7					
High schools	11	2																		1	1			1		1						1	1	1			1					1			
Industry and technology communities	18	0												1		1				1			1		1		1					2					2				1	2			
Industry association and peak body	20	11												2	1		1			2	1	2		2	1	2	3	2	2	2	2		2									2			
Innovation hub	390	289			1			17	12	12	8			33	32	6	12	17	4	40	23	26	11	36	23	22	26	24	35	20	11	44	31	3	8	18	4	13	7	37	34				
Large corporations and multinationals	12	29						2						3	3	3	1			1	4	1		2	2	1	4			2		5	1								1		2		
Library	28	0						3												3				3			3					3											3		
Local retail	4	0						2																																					
Media	5	4																																										1	
Service provider	25	18						1						3	3	1	2	2	1	2	2	1		3	2	2	1	1	3	1		3	2					1					3	2	
Startup ecosystem	42	27						2						4	4	1	2	1	4	1	1		4		3	3	2	1			4	5	3	3	3	3	2	3	3	4	3				
Technology / System	16	3						1						1						2	1	1		2		1	1				3	1											3		
Universities	20	30													4		1	1		2	5	2	1	3	2	2	8	1	5	1		2	2	1									2	2	
Total	1273	770	6	4	1	3	45	20	33	13	2	2	123	98	51	41	52	19	120	73	64	23	120	64	87	92	71	74	61	20	124	92	34	21	50	16	41	17	101	66					

6.3 Innovation ecosystem contribution to community resilience subdimensions

Social network analysis was used to explore the relationships between innovation ecosystem roles as they contribute towards each subdimension of community resilience. As described in Section 3.8, interview data was coded as roles in the innovation ecosystem acting on other roles and indicators of community resilience. The nodes of the graph are represented by innovation ecosystem roles and the edges or network paths are based on interview descriptions of one role acting on another role. A separate network graph was formed around each subdimension of community resilience. Figure 6-3 provides a summary view of all the network graphs, with the individual network graph for each subdimension examined in more detail in sections 6.3.1, 6.3.2, 6.3.3, and 6.3.4.

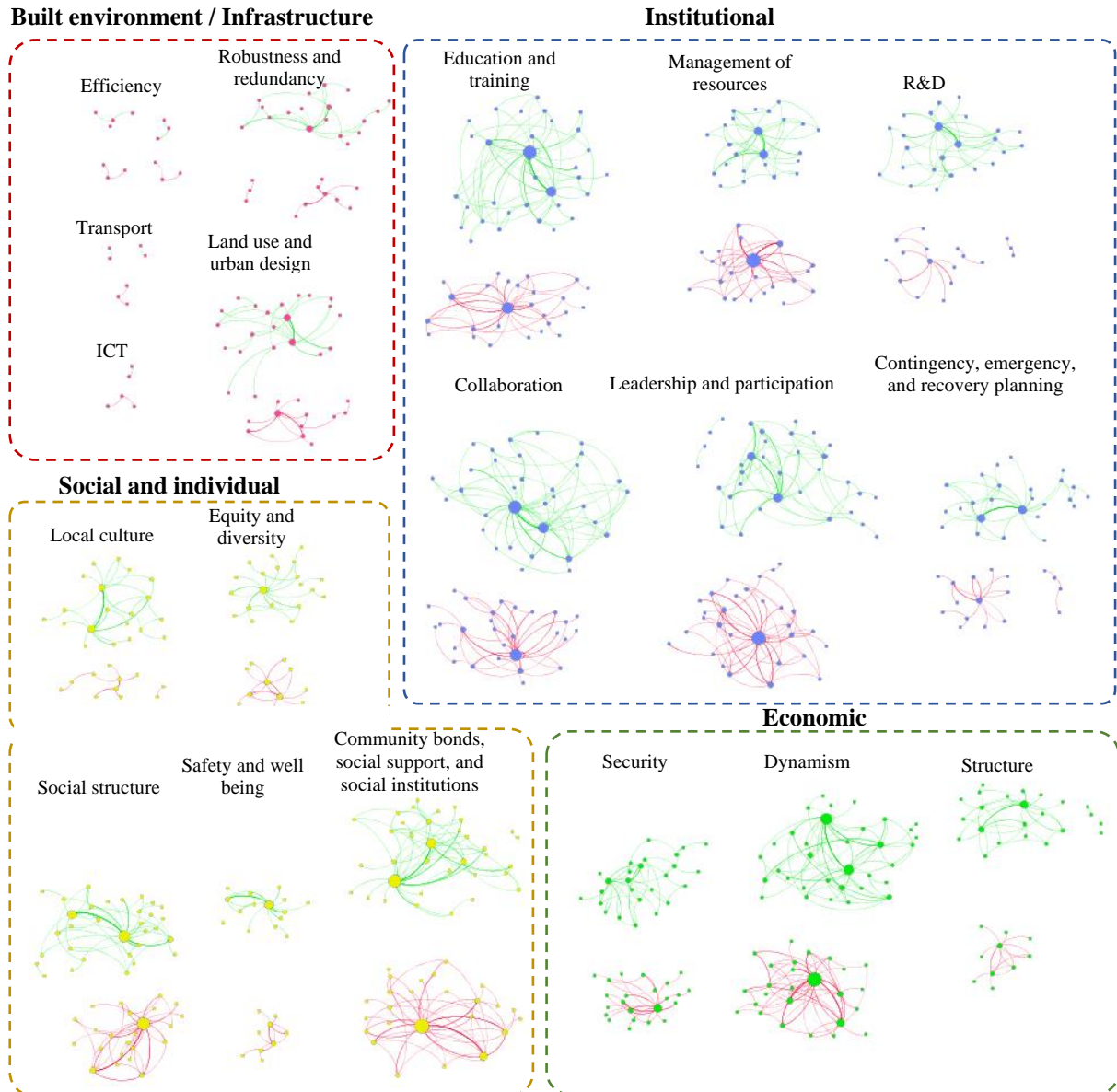


Figure 6-3 Network graph summary of enabling and inhibiting contribution of the innovation ecosystem by community resilience subdimension

6.3.1 Built environment/infrastructure

The Built environment/Infrastructure dimension involves identifying, advocating for, acquiring, developing, maintaining, and effective utilisation of the physical environment, including internet, utilities, transport, and physical assets. The dimension includes the following subdimensions: *Efficiency*; *Transport*; *ICT*; *Robustness and redundancy*; and *Land use and urban design*. References in interviews to the contribution of this dimension are described in the following section.

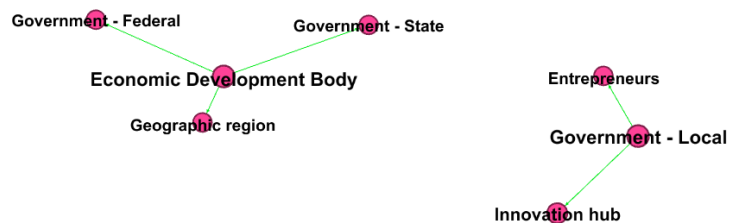
6.3.1.1 Efficiency

The Efficiency subdimension of the Built environment/infrastructure dimension of community resilience includes three indicators of “Regular monitoring, maintenance, and upgrade of critical infrastructure”, “Retrofit, renewal, and refurbishment of the built environment”, and “Infrastructure promotion and advocacy”. Only the indicator of “Infrastructure promotion and advocacy” was considered. The innovation ecosystem was not expected to be involved in “Infrastructure monitoring, maintenance, upgrade, retrofit, renewal, and refurbishment”. Government and economic development bodies were raised in interviews as advocating for infrastructure investment and development on behalf of the region overall and for specific roles in the region, such as innovation hubs and entrepreneurs (Figure 6-4).

Innovation ecosystem contribution towards the Efficiency subdimension of community resilience

Enabling contributions

- Influence
- Available resources
- Consistency
- Research and data



Inhibiting contributions

- Lack of resources
- Competing interests
- Lack of local advocacy
- Lack of local government role

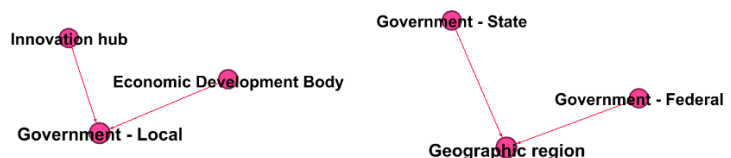


Figure 6-4 Innovation ecosystem contribution towards the Efficiency subdimension of community resilience

Enabling contributions were attributed to economic development bodies and government advocating on behalf of the region to secure investment into the region and into roles in the region, such as innovation hubs and entrepreneurs. The advocating role was perceived as more successful with increased **influence** to effect change, the ability to offer **available resources**, **consistency** of the advocating body, and the availability and quality of **research and data** to support the advocacy role. The size and scope of the impact meant that infrastructure impact was focused on larger, more established roles, as reflected by an economic development body:

“To make the infrastructure priority list for us, a project has to be a hundred million dollars and above.”

The magnitude of the challenge to support infrastructure meant that there could be a limited focus from a **lack of resources**, as noted by another economic development organisation: *“We once had 52 things on our priority. It's too many. The board made a conscious decision to rationalize and narrow the focus.”* There was also political risk from **competing interests** from other regions and other aspects of the community, as noted by a local government: *“You're dealing with financial risk, you are dealing with community backlash, dealing with political risks.”* A **lack of local advocacy** meant the influence was not always located in the region which could be compounded with the **lack of a local government role** in advocating for infrastructure, further inhibiting awareness of challenges and local impact. The respondents noted a need to support advocacy justification with data and research, as one locally based federal government representative identified a need to support infrastructure decisions through: *“creating evidence-based analysis of the pain and the opportunities being lost.”*

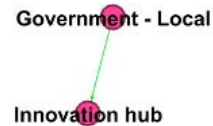
6.3.1.2 ICT

The ICT subdimension includes the two indicators of “Diverse and reliable ICT networks” and “Emergency communication infrastructure (before, during, after disaster)”. The innovation ecosystem was not considered as a contributor to the indicator of “Emergency communication infrastructure (before, during, after disaster)”. The indicator of “Diverse and reliable ICT networks” was identified based on the value of internet connectivity for the entrepreneur in the innovation hub and the role of local government in enabling connectivity (Figure 6-5).

Innovation ecosystem contribution towards the ICT subdimension of community resilience

Enabling contributions

- Advocacy
- Access to data



Inhibiting contributions

- Poor internet connectivity
- High speed internet costs

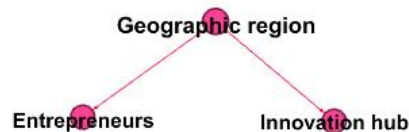


Figure 6-5 Innovation ecosystem contribution towards the ICT subdimension of community resilience

The role of government enabled ICT in the region through **advocacy** and providing the internet infrastructure in a region, as mentioned by one local government: “*We’ve got to make sure that we can service them. NBN is part of that, the fact that we’ve got a new cable coming into the region, that’s going to be huge extra capability for us.*” Another enabling contribution included providing **access to data** and hardware from government-owned ICT assets, on which entrepreneurs found beneficial to build business models. An entrepreneur who won a local government hackathon described his engagement with the local council manager, saying “*He was like, ‘What else can we provide with? They’re putting in their own weather station. Would you like a feed?’ It was quite the opposite of what we expected to be barriers.*”

There were also barriers of **poor internet connectivity** inhibiting entrepreneurs and supporting roles. This was particularly pronounced for digitally-enabled businesses, innovation hubs and ecosystem leaders aiming to support local entrepreneurs to build their business. One ecosystem leader commented that “*connectivity, being able to access the amount of data and moving data at the speed they need it to move, will continue to be a challenge for any really computer-based businesses in rural areas until there’s better internet.*” Poor internet access was attributed to “the region” or government, outside the control or influence of innovation hubs and entrepreneurs. Local government and entrepreneur support roles had to provide additional value in other areas, such as amenities, community, or collaboration potential to compensate for poor internet. **High speed internet costs** decreased the competitiveness of local

entrepreneur support providers, with one coworking space manager noting that “*the costs for us to have a dedicated gigabit fibre line here is insane.*” Without other value propositions, entrepreneurs sought out other regions and moved to access outcomes through better internet connectivity.

6.3.1.3 Land use and urban design

The Land use and urban design subdimension of community resilience includes 15 indicators:

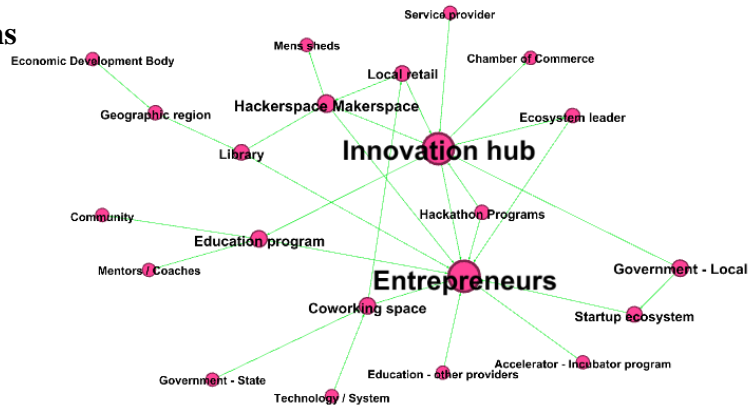
- Accessibility of basic needs and services over time (food, water, shelter, energy, health)
- Accessibility of basic needs and services over time (education)
- Aesthetics, visual qualities
- Amount (per cent) of impervious surfaces
- Density of development
- Green and blue infrastructure
- Landscape-based passive cooling
- Mixed-use development
- Public spaces and communal facilities
- Passive lighting
- Passive heating
- Passive cooling
- Site selection and avoiding risk and habitat areas (floodplain, flood prone, exposed coastal zone)
- Street connectivity
- Urban form (compact, dispersed, etc, SVF, aspect ratio)

Of these indicators, only two were identified in the retroduction stage outlined in Section 4.2 and confirmed from the interview data as being contributed to by the innovation ecosystem: “Public spaces and communal facilities” and “Accessibility of basic needs and services over time (education)”. These two indicators related to physical space roles as shared spaces to support innovation and entrepreneurial activity (Figure 6-6).

Innovation ecosystem contribution towards the land use and urban design subdimension of community resilience

Enabling contributions

- Surrounding retail
- Use existing assets
- Third space
- Flexibility
- Accessible
- Diversity of spaces



Inhibiting contributions

- Constraints from space owners
- Remoteness
- Lack of permanency
- Lack of security
- Lack of diversity

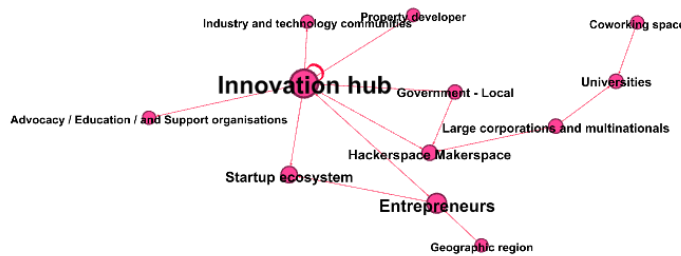


Figure 6-6 Innovation ecosystem contribution towards the land use and urban design subdimension of community resilience

Physical spaces (e.g., innovation hubs, libraries, local retail, hackerspaces/makerspaces) provided a ‘**third space**’ for communal activities including, as mentioned by an innovation hub: “...a centre of gravity, a lot of people can come here for meetups – creating a gravitational pull.” Entrepreneurs also commented on the value of making use of a shared physical space, with one commenting that: “I had a home office and I built the office downstairs and home upstairs and I was always by myself. Coming to the innovation hub, you get surrounded by likeminded people. That was important.” Another entrepreneur commented that: “a space where I can come, be in community, work, and whatever else I need means the difference between me continuing.” Organisations that supported and sponsored the space also commented on new approaches for the **use of existing assets** for shared spaces, such as libraries:

“The roles of libraries now is that there's going to be those additional services. We're already seeing the style of this with the concept of the makerplace. Now we can go in

there and experiment with some of the new technologies, the concept of acquiring new skills.”.

The **surrounding retail** and local amenities were also noted as important, with a coworking space commenting on the benefit of: *“being located in a space that's got lots of shops and bars and restaurants... You can't just be stuck in a building in the middle of nowhere.”* There was also value in having a **diversity of spaces** in a region as people looked for **flexibility**, with another coworking space noting: *“it just creates spaces for people that are entrepreneurs or smaller teams.”* There were also different perceptions as to what was expected from the space. One local government took a negative view of the local space expecting entrepreneurial outcomes: *“We have a very sporadic innovation infrastructure. We have a couple of players who pretend they're in that space and market themselves as being innovation hubs and they're actually not.”* Entrepreneurs on the other hand could be seeking more creativity from their local coworking space, as one entrepreneur confessed: *“I wouldn't take my team into the local innovation hub. I would want a space that is very inspiring, and you walk in and go, ‘Oh wow, this is cool.’”*

The physical location of the space mattered, with distance from areas of density or **remoteness** being identified as an inhibitor. As one university noted *“it's hard enough in a city when you have all the tools and all the assets that your disposal, so you throw in another layer of difficulty if you impose barriers of remoteness.”* The lack of natural physical connectivity through population density needed to be compensated or with digital and social connectivity. A coworking space highlighted this challenge of geographic spread in the region: *“that's been the biggest challenge being so spread out across the space. For us really to connect properly, we need to be catching up every couple of weeks.”*

The style and culture of the physical space was also important. While temporary ‘hot desks’ could initially be valuable, innovation hubs commented on members desiring permanency and belonging: *“People started saying things like, ‘I really liked this desk. I get hot desking, but I'd like for this to be my permanent’.”* Entrepreneurs who were expanding highlighted a need for **permanency** and **security** in the shared space: *“because we've got quite expensive gear we need a higher level of security and not just leaving everything in here in the open.”* Other tenants were limited by **constraints from the space owner**, as one hackerspace noted when using space from a shopping mall or a local council innovation hub, *“we started in the shopping centre, and there were heavy limits to what we could do. We moved to the local government-*

owned innovation hub, which provided certainty and greater resources, but at the same time did limit us.”

6.3.1.4 Robustness and redundancy

The robustness and redundancy subdimension includes the following eight indicators:

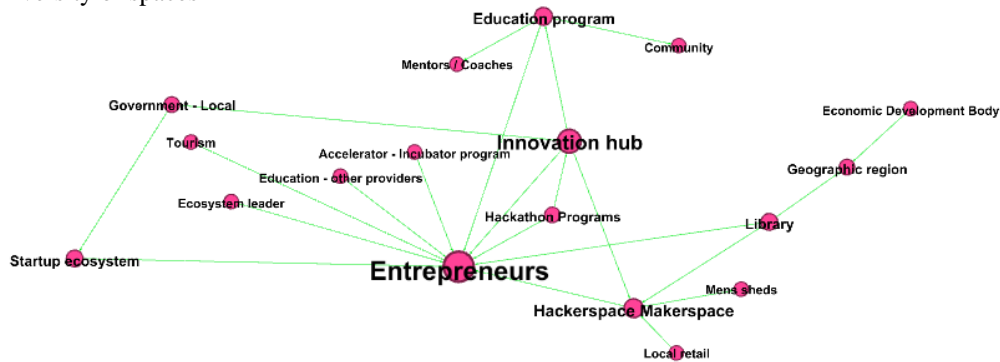
- Collaboration between utility providers
- Consolidation of critical utilities
- Location of critical infrastructure and facilities
- Multi-functionality of spaces and facilities
- Redundancy of critical infrastructure - facilities, stocks, ecosystem
- Robustness and fortification of critical infrastructure - vital assets
- Shelter and relief facilities and services
- Spatial distribution of critical infrastructure (measure against cascading effects)

The indicator of “Multi-functionality of spaces and facilities” was the primary indicator coded against the interviews. Multiple roles were associated with the subdimension predominantly related to the use of physical spaces (Figure 6-7).

Innovation ecosystem contribution towards the robustness and redundancy subdimension of community resilience

Enabling contributions

- Third space
- Flexibility
- Accessible
- Diversity of spaces



Inhibiting contribution

- Competing interests
- Constraints from space owners
- Operating in silos

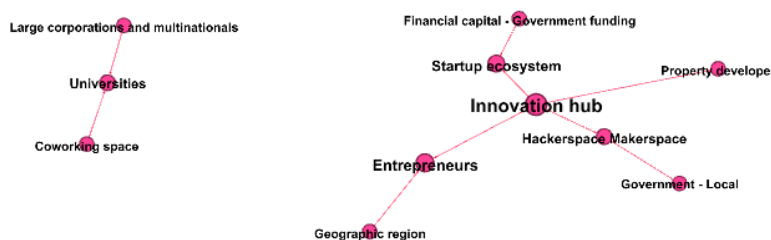


Figure 6-7 Innovation ecosystem contribution towards the robustness and redundancy subdimension of community resilience

The robustness and redundancy subdimension shared many enabling factors with those for the land use and urban design subdimension, with the indicator of “Multi-functionality of spaces and facilities” being similar in nature to the land use and urban design indicators of “Public spaces and communal facilities” and “Accessibility of basic needs and services over time (education)”. As **flexible, diverse, and accessible third spaces**, pubs and libraries were noted as useful makerspaces and a meeting location for innovation activities. A hackerspace described men’s sheds as both providing abilities to work on projects, as well as build community and support mental health, while a hackerspace is more focused on collaboration and tools: “You go in (to the men’s shed) and it’s not really active but provides a meeting place for people of those demographics. We’re more about the tools and being a collaborative

space.” An entrepreneur described the innovation hub as a place to get work done as well as build community around a common element of the pool table: *“Any challenges with being here? No, other than that pool table. Sometimes I get distracted and have too many games of pool, but I love coming in here.”* One example of a unique multi-functional space was provided by a respondent representing a Chamber of commerce who shared the example of a local camel farm that also provided tourism opportunities and innovation capability for the region: *“They’re a prime example of food tourism. It’s a large-scale operation where they’re producing export ready product in the food and cosmetics sector and they’re a startup.”*

Perceptions of **competing interests** and increased competition could bring diversity and improved quality of spaces to the region. A local government described property developers creating multi-purpose spaces that offered coworking in addition to the local government-run innovation hub: *“We’re seeing a lot of the real estate agents moving into the shared model. It is becoming more competitive. But the other opportunities are helping to change people’s awareness of what’s going on.”* Roles **operating in silos** could prevent the usage of spaces. A university commented on offering commercialisation opportunities that were not taken advantage of by corporate roles: *“The connectivity between large business, large organisations and universities is low.”* A local government described their innovation hub as having *“acted as a siloed activity. Council operated smart cities activities independent of the innovation hub. We started to engage with other partners, including the state government on our Advancing Regional Innovation Program, which acted in a silo of its own.”*

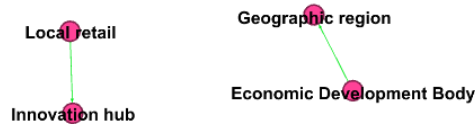
6.3.1.5 Transport

The transport subdimension includes two indicators of “Capacity, safety, reliability, interestedness (connectivity) and efficiency of transportation” and “Inclusive and multi-modal transport networks and facilities”. Roles associated with the Transport subdimension of community resilience included the innovation hub, local retail, the geographic region, the economic development body, and state and federal governments (Figure 6-8).

Innovation ecosystem contribution towards the transport subdimension of community resilience

Enabling contribution

- Proximity



Inhibiting contribution

- Advocacy effort



Figure 6-8 Innovation ecosystem contribution towards the transport subdimension of community resilience

The topic of transport was not raised in the research as a significant topic related to the innovation ecosystem, but there were some enabling and inhibiting factors identified. The dimension of transport was attributed to the **proximity** of innovation ecosystem services. One innovation hub commented on the ease of access via roads: “*Being able to access your work in close vicinity to where you live and reduce your travel time plays a major role in the lifestyle component.*” Economic development bodies played a more hands-on role in coordinated efforts for the development of logistics and distribution centres:

“We do economic development work, which is different to the advocacy space. We work with several stakeholders to generate economic development opportunities. A state government wants to create a \$10 million export distribution centre, so our region is putting a bid in with state government and our organisation is coordinator of that bid.”

Support for improvements to transport needed research and data. A lack of adequate research and data inhibited the function of **advocacy** to government. A government representative commented with a sense of frustration at the magnitude of the task of addressing road infrastructure:

“...that whole stretch of road is useless to people who want to move freight. We need to lobby the feds. That's owned by transport and main roads of Queensland department,

but it's still lobbying the feds to give the money to transport and main roads to fix the thing. And that's creating evidence-based analysis of the pain and the opportunities being lost.”

6.3.2 Institutional

The Institutional dimension consists of “both of organisations (‘formal structures with an explicit purpose’), such as political administrations at all spatial levels, trade unions, large enterprises and business support agencies, and ‘things that pattern behaviour’ such as norms, rules and laws” (Edquist, 1997, p. 27). Institutional subdimensions include: “Collaboration”; “Contingency, emergency, and recovery planning”; “Education and training”; “Leadership and participation”; “Management of resources”; and “R&D”. The enabling and inhibiting contribution of the innovation ecosystem to the institutional subdimension is outlined in Section 6.3.2.1 below.

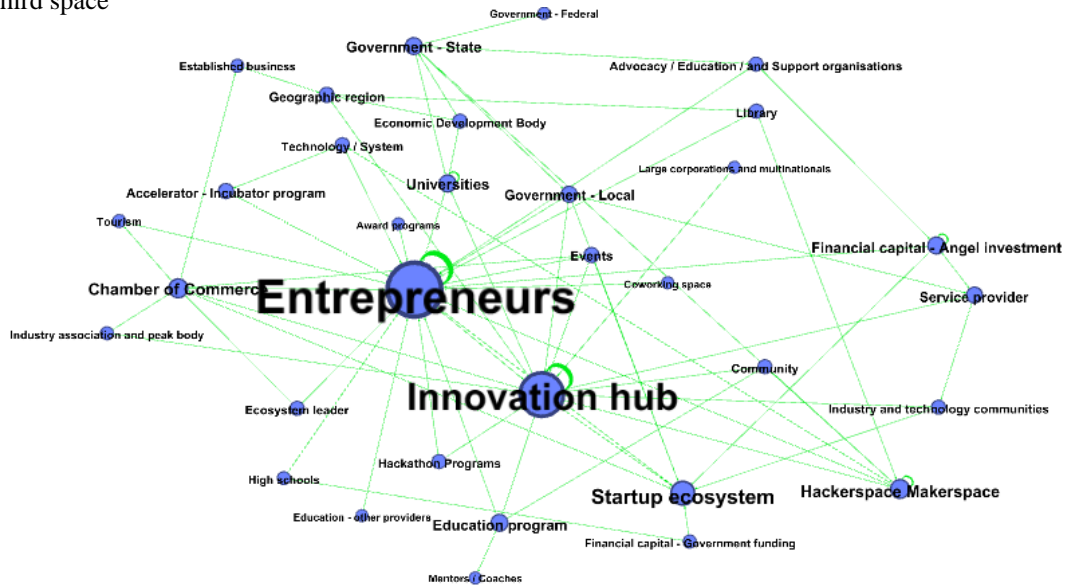
6.3.2.1 Collaboration

The Collaboration subdimension of community resilience includes three indicators: “Cross-industry sector collaboration”; “External MOUs”; and “Knowledge and information transfer”. Most innovation ecosystem roles were highlighted as relating to collaboration in some way (Figure 6-9).

Innovation ecosystem contribution towards the collaboration subdimension of community resilience

Enabling contribution

- Operational integration
- Momentum
- New projects
- Structured programs
- Events
- Third space



Inhibiting contribution

- Lack of trust
- Competing interests
- Dependant on the individual
- Australian independent culture
- Low perception of value
- Operating in silos

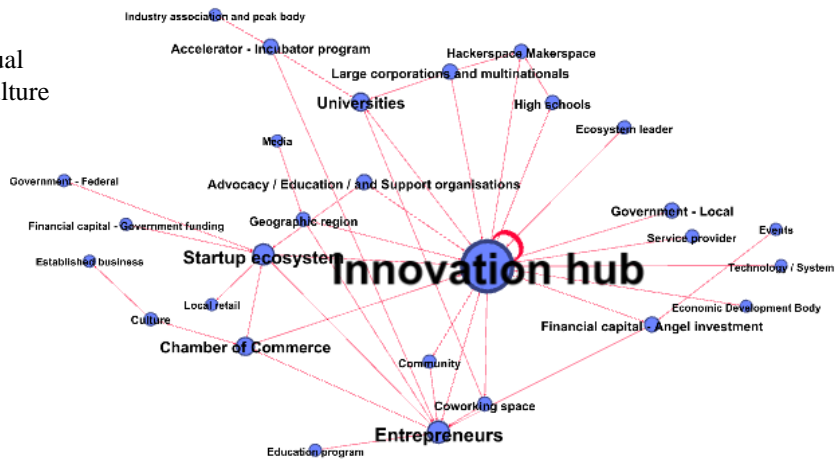


Figure 6-9 Innovation ecosystem contribution towards the Collaboration subdimension of community resilience

Collaboration frequently happened during change that created **momentum** and often involved **new projects**, such as developing a new accelerator program or building a new aspect of the innovation ecosystem (e.g., innovation hub, local angel investor group). A chamber of

commerce collaborated with a peak body to deliver an innovation-focused program to members that involved multiple sectors: *“The program initiative is led by the Chamber of Commerce, but recognizes a niche cohort within our membership that operates within the food production, hospitality, food, tourism and food manufacturing sectors.”* A regional innovation hub shared about how a local angel investment group was formed, with the hub hosting the angel group, the state government’s entrepreneur advocacy program helping to recruit local investors, and the angel investment group from the state’s capital city providing support and initial deals. Local entrepreneurs worked with local government after winning an industry-sponsored hackathon competition in the local government-run innovation hub: *“They [the local council] were willing to release information. He was like, ‘what else can we provide with?’”*

Collaboration occurred when there was **operational integration** with each parties’ operational needs or was necessary for operational delivery by each party. This integration often occurred around **structured programs** such as accelerator programs rather than general concepts of entrepreneur activity. An innovation hub described program development and delivery with a local university: *“We do a lot of work with the university. We filmed four one-hour videos for their students.”* A technology community created by a service provider described mentoring at an innovation hub to entrepreneur members in exchange for the hub providing the technology community use of the venue to hold events: *“The innovation hub jumped at the opportunity to have us one day a month from our meetup group.”* A local government shared how funding required all three levels of government to support entrepreneurs and develop programs, *“Something new always costs money, although we're getting a lot of support through the state government department and the federal government incubator support programs.”* One economic development body worked with the university and government to secure local investment for the regional area: *“at the university, one of eight priority projects is to work with them to encourage government to invest with them.”*

The innovation ecosystem also played a role in supporting knowledge transfer, frequently occurring through **events** and in a **third space** such as an innovation hub or hackerspace/makerspace. Entrepreneurs gained value from the innovation hub, with one saying *“you could easily find an information night, have a chat to someone, get real-life scenarios or costs, and then reuse that information”*. A hackerspace described the community learning through participating: *“The idea with the electronics is that the community gets together and we get the equipment that you can do a good job. A lot of learning comes out of pursuing your own interests.”* A young entrepreneur described participating in an accelerator program run out

of a high school delivered by the local innovation hub accessing mentors from the local business community: *“we had people from different industries, you're able to pitch your idea to them and they're able to help you and give you more ideas.”* Knowledge transfer also happened in developing the innovation ecosystem itself. An entrepreneur in a regional area described the process of going to the capital city to learn how to deliver hackathons: *“I went to that startup weekend to find out how they do it and come back here and deliver that here.”*

There were also inhibiting factors in relation to the innovation ecosystem's contribution to collaboration. Collaboration was often **dependent on the individual leader** to drive the outcome rather than being integrated across an organisation or through a region. A university commented that *“those programs, whilst they're good and successful, are the product of somebody who is passionately committed to that area instead of a strategic decision by the university to pursue rural and regional entrepreneurship.”* There were also barriers related to the **Australian independent culture** perceived at the regional and national levels, reflected by a local chamber: *“we only really collaborate well together if there's a disaster... But in terms of everyday business, we make our own way. If something's not working, we'll just start something else which you can see has happened in regional Australia.”*

Collaboration came at a cost, and the value of those supporting collaboration was not always recognised. One ecosystem leader described the **lack of value** for support of collaboration in the creative industries: *“Whenever you need something to be amazing and attract a whole bunch of people, you call on the creative industries... then at a certain point it becomes ‘let's build buildings and infrastructure’, and the creative industry gets forgotten again.”* Another inhibiting factor to collaboration included a **lack of trust** from the perspective of an entrepreneur: *“I like the ecosystem leader, don't get me wrong, but I have heard the person speak about other people and then I don't feel like what I say is in confidence. For me, trust is a big one.”* **Silos** operating within institutions and programs were also an issue, which was experienced when university or government established programs or hubs that were in competition with community-run endeavours. One community coworking space observed that *“We've held events that the university has been involved with here, but I guess it's difficult since they are aligned with the university innovation hub.”*

6.3.2.2 Contingency, emergency, and recovery planning

Thirteen indicators are included as part of the Contingency, emergency, and recovery planning subdimension:

- Integration of risk reduction and resilience into development plans and policies
- Existence of climate change and environmental policy and plans
- Understanding risk patterns and trends
- Continuous and updated risk assessment, scenario making for different kinds of infrastructure and services (costs, losses, etc.)
- Emergency planning and existence of emergency operations centre that integrates different agencies and organisations
- Availability and update of contingency plans (e.g., post-storm traffic management)
- Availability of mitigation plan
- Early warning, evacuation plan, and access to evacuation information
- Inclusion of transient population (tourist, etc.) in emergency planning
- Inclusion of disaster resilience and lessons learned in the recovery plan
- Speed of recover and restoration
- Ongoing process of revising and monitoring plans and assessments
- Standardised, updated, and integrated databases for action planning, monitoring, and evaluation purposes

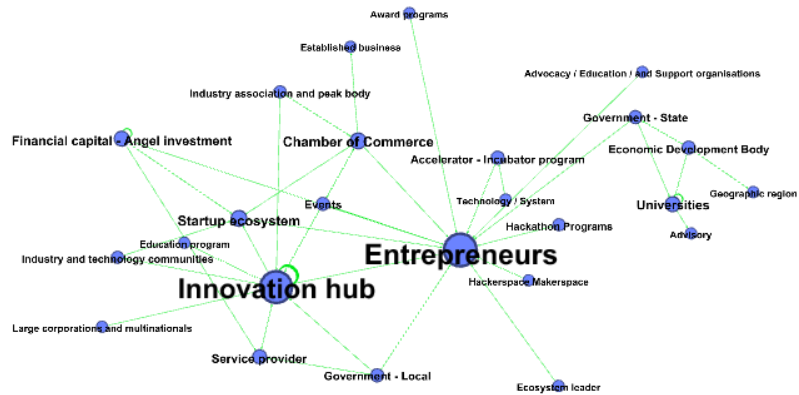
Of the indicators, two were considered as being contributed to by the innovation ecosystem: “Understanding risk patterns and trends” and “Integration of risk reduction and resilience into development plans and policies”. These two indicators were interpreted as applying to influencing policy and understanding risks and trends as they related to market disruptions that impacted on the local community. Twenty-six roles were identified as relating to enabling or inhibiting contributions (Figure 6-10).

It should be noted that the data was collected prior to the COVID-19 pandemic. While some regions were impacted by disruptions from industry changes such as mining, these were seen as a need to prepare for long-term transition through opportunities rather than respond with an immediate emergency response. The results would be expected to be different in light of the immediate economic and social impacts from the pandemic.

Innovation ecosystem contribution towards the Contingency, emergency, and recovery planning subdimension of community resilience

Enabling contribution

- Media and promotion
- Award programs
- Dedicated leaders
- Advocacy
- Clear accountabilities and responsibilities



Inhibiting contribution

- Lack of data
- Operating in silos
- Lack of priority
- Lack of communication
- Fear of political risk
- Lack of leadership and direction
- Lack of funding

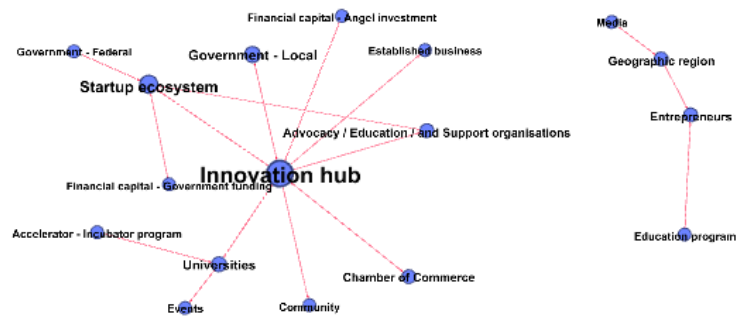


Figure 6-10 Innovation ecosystem contribution towards the Contingency, emergency, and recovery planning subdimension of community resilience

The innovation ecosystem enabled regions to understand trends and integrate that understanding into planning and policy. The focus was not as much on risk, as it was proactively developing innovation opportunities and capacity as a mitigation strategy for the region. **Award programs** and related **media and promotion** were part of this response process to raise awareness. An innovation hub speaking about the ability of the state-based event to raise awareness about trends, commented that: *“We had quite a few representatives there to showcase what innovation means to us and what innovation means to the whole of Australia through the startup garage.”* A local government clearly articulated this value in speaking about a local awards program they developed in collaboration with the local innovation community:

“We want to reward people who were doing well and the publicity to provide the participants with exposure and inspire other people. We want other businesses or individuals who are thinking about starting businesses to look at that and go, ‘I didn't know this was happening.’ You don't necessarily have to go outside the region to find these kinds of businesses. Getting young people involved, getting that going through generations, and starting a new kind of culture.”

Efforts were explicitly articulated as contingency planning for economic disruption and **advocacy** by local government played a role in these efforts. An interviewee from a local government responsible for establishing an innovation hub commented that *“the digital hub is at the core of the diversification of the economy....”*. The innovation hub manager reflected this sentiment in a separate interview, describing the rationale behind the local government creating the innovation hub:

“The council has funded, built and developed a digital hub to catalyse and accelerate the development of a digital sector in the region that has typically been a highly reliant on the tourism, construction and retail sectors for economic growth and as obviously wanting to diversify and build new high wage sectors that offer good opportunities for local people.”

The diversification for contingency perspective was shared in different regions, from the tourism sector threatened by climate impacts to the mining sector. A local ecosystem leader shared: *“The argument is to diversify the industry away from mainstream operations of two industries, sugar and mining.”* An economic development organisation also commented on diversifying the local agriculture sector: *“We started on the back of local businesses wanting to get a hand into the big gas companies. We're now using a model into the food and agriculture into the health sector and simply with diversification cost.”*

There were several inhibitors shared with other community resilience subdimensions such as **operating in silos**, a **lack of communication**, **fear of political risk**, **lack of leadership and direction**, and **lack of funding**. These factors mitigated the ability to influence policy and raise awareness of trends. Another inhibiting factor raised was a **lack of measurement and available data**. For example, one university questioned the lack of metrics to support outcomes: *“I mean, what is the churn on that? What is the complete abject failure? What are the outcomes, and what are the inputs?”* Another innovation leader shared the danger of poor

metrics in media, noting: *“The region is not the entrepreneur capital of Australia. It's got potential, but there's a lot of work to do. You cannot believe the hype.”*

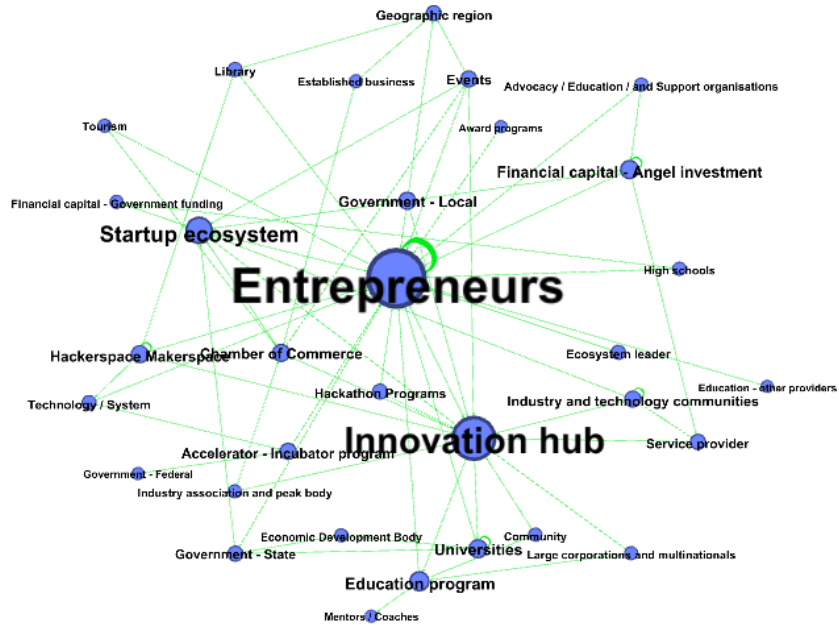
6.3.2.3 Education and training

The Education and training subdimension includes indicators of “Capacity building and enhancing awareness”, “Mitigation and adaption incentives”, and “School-age adaptation”. The two indicators of “Behavioural issues and demand management” and “Drills and exercises” were not considered. The subdimension was represented by 33 roles (Figure 6-11).

Innovation ecosystem contribution towards the Education and training subdimension of community resilience

Enabling contributions

- Events
- Hackathons
- Award programs
- Integrated collaborative programs
- Social sharing
- Senior leadership and advocacy



Inhibiting contributions

- Operating in silos
- Lack of research and data
- Disruption to young people
- School engagement
- Lack of program follow-through
- Lack of leadership



Figure 6-11 Innovation ecosystem contribution towards the Education and training subdimension of community resilience

The innovation ecosystem has an obvious contribution towards “Capacity building and enhancing awareness” and “Mitigation and adaption incentives”. Several entrepreneurs

described how they became aware of opportunities through **events, hackathons, and award programs**, which then helped them adapt to their situation. One entrepreneur shared a story about a weekend hackathon sponsored by local industry and council that allowed him and his brother to finally start what eventually became an award-winning business, moving from a *'wantapreneur to an entrepreneur'*. From an entrepreneur winning a startup weekend, which allowed her to attend the global competition in Europe, to another inspired to start a business through attending events in a local innovation hub, the innovation ecosystem raised the profile of entrepreneurs and built capacity in individuals that resulted in action.

Social sharing was important at all levels to introduce new concepts to people and prepare them for learning. The source of this sharing came from promotion **at senior leadership and advocacy** in government via formal media channels through to family and friends through word of mouth. A Chamber of commerce described a local mayor leveraging a regional award to develop the narrative for the region: *"our former mayor used to talk about an award that we were voted in the top five smart cities in the world."* Another entrepreneur engaged with the startup ecosystem through prompting by his mother in the family business:

"I wasn't even really aware of the startup space. I was just doing what I was doing, and I didn't know. There was an entrepreneurial startup investment by the government, all of that was unknown to me. My mom heard about the innovation awards from somewhere and said, 'oh, you should put this in because it's innovative for our industry'."

School-age adaptation was also evident. Local governments provided funding for school entrepreneurial programs, local schools created collaborative region-wide entrepreneurial programs, universities delivered youth-focused startup weekends, hackerspaces provided intern opportunities for high school students, and innovation hubs partnered with universities to deliver school programs. A young entrepreneur described his experience in an accelerator program delivered by the innovation hub in the local high school: *"The program was the first the school had run. The program helped me map the strategy to take on this business idea that I have."*

While the innovation ecosystem contributed to education and training, some entrepreneurs reflected on a **lack of program follow-through** and felt they were on their own after programs ended without clear direction where to go next. Programs could **operate in silos**, reinforced when education program providers focused on: *"What's in it for me?"* as one ecosystem

leader described. Other inhibiting factors include a **lack of data** to support evidence of impact and a **lack of leadership** and direction at the local level.

Other inhibiting factors were specific to school-age adaptation, with a key challenge being engaging with innovation and entrepreneurial opportunities requiring **disruption to young people** needing to move. This was highlighted by a university supporting young people living in regions to transition to entrepreneurial activity and move to more populated regions: “...you're going to get up and leave mom and dad and your brothers and sisters and all your friends and you're going to go maybe million miles away and live by yourself.” **School engagement** was also a challenge, as shared by one innovation hub: “I'll tell you it's the death of me. Youth entrepreneurship is so hard compared to everything else we do. It is ridiculously hard to get the schools engaged...”

6.3.2.4 Leadership and participation

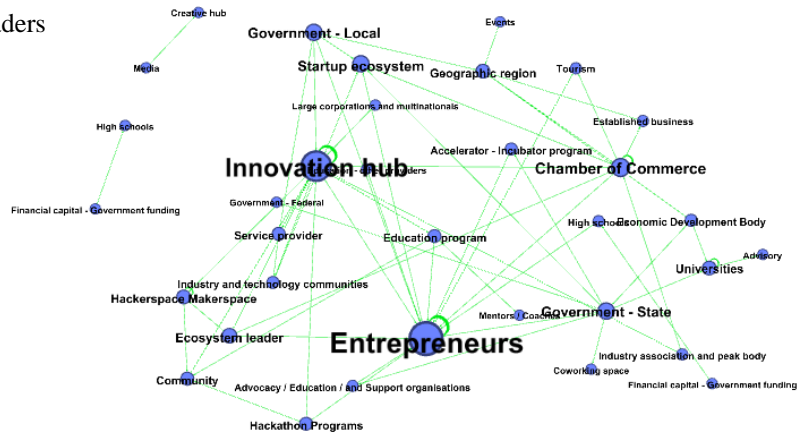
The innovation ecosystem contributed significantly to the Institutional subdimension of Leadership and participation. All roles in the innovation ecosystem were identified as contributing to Leadership and participation (Figure 6-12), which includes the following indicators:

- Strong leadership,
- Stability of leadership and political stability,
- Shared, updated, and integrated planning vision (long-term),
- Transparency, accountability, corruption, etc.
- Multi-stakeholder planning and decision making,
- Decentralised responsibilities and resources, and
- Efficient management of resources (funds, staff, etc).

Innovation ecosystem contribution towards the Leadership and participation subdimension of community resilience

Enabling contributions

- Collaborative leadership
- Strong top vision
- Support for local community leaders
- Multiple points of leadership
- Local leader community focus



Inhibiting contributions

- Australian independent culture
- Lack of transparency
- Lack of governance
- Corruption
- Lack of legitimacy
- Lack of leadership and direction

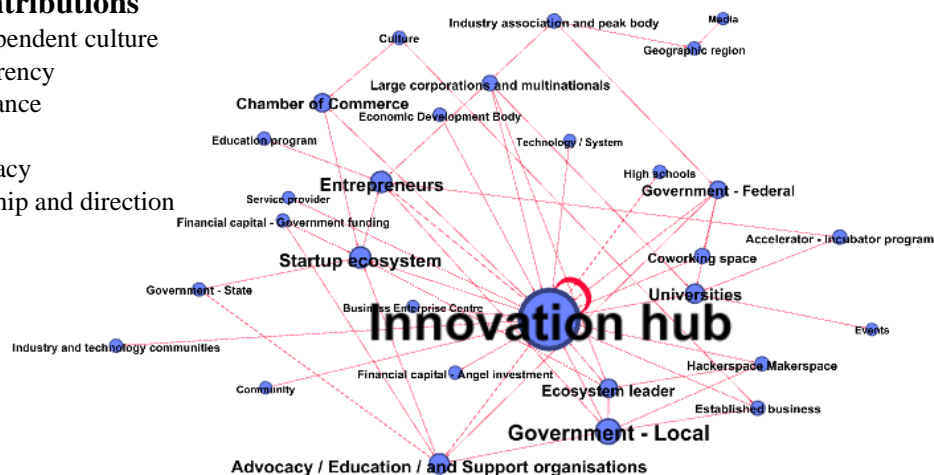


Figure 6-12 Innovation ecosystem contribution towards the leadership and participation subdimension of community resilience

Leadership was both distributed and centralised. All levels of government played a key role as an enabler to **provide stability, strong leadership, and establishing the local vision**. At a national level, the federal government’s 2015 National Innovation and Science Agenda changed the conversation, as noted by a local government representative: *“It’s certainly changed the conversation and that’s a long-term culture change that happens over time.”* State governments followed suit with programs and policy, with one local entrepreneur sharing how they became aware of the opportunity through government investment: *“I wasn’t even really aware of the startup space. Then there was a whole entrepreneurial startup investment by the government, all of that was unknown to me.”* Local governments helped develop the narrative

for the local community. A chamber of commerce shared how one mayor played a key role in conveying the intent behind innovation: *“And that mayor did a fantastic job of explaining and dispossessing people the mistaken notion that innovation was about the NBN or internet connectivity. It's more about community connectivity.”*

Leadership was evident across in roles in the ecosystem. One high school delivered accelerator programs and another high school brought multiple schools together to create a youth technology community: *“a connector to place – we understand the business through to the developer and across a lot of those different sectors.”* The innovation ecosystem brought together long-established institutions, such as government, universities, and chambers of commerce with new and emerging roles of hackathons, accelerators, and innovation hubs. As a chamber of commerce noted that the 112-year legacy of chamber membership is *“a con in terms of maintaining relevance, but the pro is a very proud, very strong collegiate and community history”*. In response, the chamber also partnered with an external innovation program recognising *“that chamber’s services need to continually evolve and stay relevant”*.

The innovation hubs provided a long-term vision of diversification and economic and social impact in the region, while other roles that supported hubs, such as universities and government acknowledged the need for innovation hubs to evolve. One local government shared: *“The innovation hub is going through a period of transition. It's a necessary evolution in its life cycle as an innovation hub.”* Structures such as advisory boards helped provide governance, guidance, and structure for the innovation hub. These structures provided oversight for innovation hubs owned by institutions, such as universities and government, while board members provided access to specialist networks and international experience.

The local ecosystem leader is a key role in the ecosystem and **a focus on community by local leaders** was evident. These individuals could work in different organisations' such as an innovation hub, high school, service provider, or local council, and played a facilitating role in bringing people together. Occasionally employed by a government or a university, the roles continued to support and mentor after leaving a legitimate position: *“Since I finished four months ago, I've had at least half a dozen startups be in contact. They've been round home, I'm having lunch with some in the city, those relationships are ongoing through Slack, email, lunches, through mentorship.”* The leaders acted as boundary spanners and connectors, going to events in other groups and hubs to find opportunities for members: *“What I really do at those events is find opportunities for my members to build their businesses.”* The efforts of the leaders

was respected by members even if much of the work the leaders did was unseen, with an entrepreneur describing a hub manager saying: *“She’s very good at her job. She pulls everyone together. She’s always organizing events or little meetings and things I don’t even know.”* The leaders often provided direction in the absence of other more legitimate forms of leadership. The effort was often based on personal passion and could be at odds with the role that funded them, such as a university or government. One leader described their role as *“kind of running a bit rogue, which meant that we could capitalise on opportunities and make a difference and move quickly.”*

Just as government’s role was prominent as an enabler, the inhibiting contribution of government leadership was also highlighted. An innovation leader speaking of the local government contribution to innovation outcomes noted **an absence of senior vision and leadership**, with direction being driven at the program and initiative level: *“Those things aren’t happening unless they’ve been driven by a specific program or a need. There needs to be a central person, ideally leading a team who is about building community with regards to a strategy to take it forward..”* A peak body commented on a lack of singular responsibility for innovation activity, observing that *“it’s the challenge of having someone to take responsibility for it. You need someone who’s going say ‘if it all goes wrong, we’re it’.”*

The **lack of leadership** was observed at all three levels of government. An innovation hub commented on the support of the local government: *“...they lack direction about what that ecosystem looks like and how to actually get to that end goal, or even what the end goal looks like.”* A peak body shared concerns about the federal government: *“We don’t have a consistent definition for economic development in Australia.”* Where there was strategy, there was a perception that preference in state policies favoured some over others as noted by a regional advocacy group: *“My sense is that sometimes state government wants to back a winner. Sometimes the attention is on trying to identify that organisation while overlooking the organisations that actually make a difference.”*

The inhibiting contribution of government was highlighted in relation to **transparency**, **accountability**, and **corruption**. During the period of this research, the mayor of a local government was convicted of corruption and subsequently all counsellors were stood down by the state government’s Crime and Corruption Commission. This same council had established an innovation hub in the region. The mayor had previously reflected that the innovation hub supported an idea that the region was ‘*open for business*’. Following the mayor’s arrest, a local

business leader shared that *'the region was open for business but only for some'*. The impact of the corruption was reflected across the local innovation community, including a local incubator (*"...with all that political nonsense, it is left to people who don't understand what the innovation hub needs to achieve or should be achieving.*), entrepreneurs (*"there were information nights that I wanted to attend and all of a sudden overnight everything got squashed or postponed."*) service providers (*"momentum lost... I've seen a lot of potential entrepreneurs drop out or essentially give up their idea or take up elsewhere."*), and the local government (*"for small to medium businesses there has been a significant impact on confidence, I think that goes without saying."*).

In regional areas there could be a centralisation of innovation resources, such as when a local government or a major university developed an innovation hub. This created competition with other local community-based providers like coworking spaces who felt there could be a lack of engagement due to saturation of events and content. Subsidised competition could prevent other actors from engaging, with a chamber of commerce noting: *"I don't think that a privately owned hub can do it better than what the council one can."* Separate advocacy groups were seen as mitigating this effect, with a local council identifying the need *"to provide that community voice"* and acknowledged the innovation hub did *"have that council message coming through"*.

Decentralised models emerged through committees and collaborative groups, but a **lack of structured governance** was observed by the collaborative group: *"we were making independent calls on a funding opportunities or support informed by each other, informed by back chatter."* New innovation hubs and collaborative groups struggled with legitimacy and support from established institutions. Local government engagement took a long time and required significant effort in stakeholder engagement. One innovation hub frustrated with working with government on collaborative approaches shared *"It's like the carrots dangled here and then it's over there and then it's in the back of the room. Do I have the time and energy?"*.

New forms of leadership structures were emerging in regional areas. Innovation hubs, coworking spaces, and individuals often performed a community leadership function, but lacked the resources and legitimacy to have influence and sustainability. Institutions, such as government and universities, had the legitimacy and resources but lacked the vision and

capability to execute. New forms of collaborative leadership structures were emerging, as described by one regional innovation leader:

“There is huge value in everybody working together. There needs to be a role dedicated to being that central liaison person that helps everybody work together. Who funds that? The best model would be funded partially by local council, some state government funding, but then also private entities coming onboard, everybody pitching into the person's salary.”

6.3.2.5 Management of resources

The Management of resources subdimension includes the following indicators:

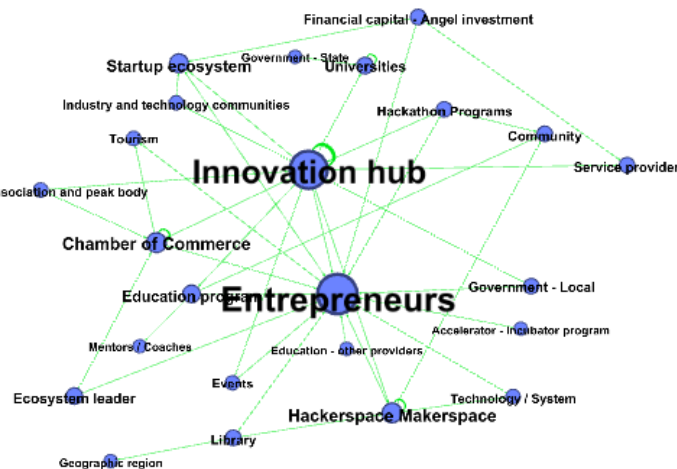
- Efficient management of resources (funds, staff, etc.)
- Skilled emergency practitioners
- Skilled personnel
- Population with emergency response and recover skills (first aid, etc.)
- Redundant capacity in terms of personnel

The two indicators relating to emergency practitioners and response recovery skills were not considered as being influenced by the innovation ecosystem. Most roles in the innovation ecosystem were identified with contributing to the three indicators of “Efficient management of resources”, “Skilled personnel”, and “Redundant capacity in terms of personnel” (Figure 6-13).

Innovation ecosystem contribution towards the Management of resources subdimension of community resilience

Enabling contributions

- Mentoring
- Events
- Collaborative spaces
- Resource sharing
- Focus on fewer, higher quality initiatives
- Distributed capability



Inhibiting contributions

- Lack of capability
- Leader burnout
- Fragmented approach
- Emerging roles
- Low number of specialist skills
- Operating in silos



Figure 6-13 Innovation ecosystem contribution towards the Management of resources subdimension of community resilience

Time and the evolution of the innovation ecosystem played a role in the contribution of the innovation ecosystem towards management of resources. Skilling of individuals was evident through **events** and **mentoring**, engagement with digital skills through **collaborative spaces** such as hackerspaces and libraries, and through **distributed capability** as service providers (e.g., lawyers, accountants) became proficient in specialised innovation skills and as angel investors. Innovation spaces such as creative hubs were seen as offering a form of training suited for those not engaged with institutionalised training approaches. A creative hub articulated the value of the creative hub in providing a unique environment for training: “There

would have been more formalized training and experience opportunities provided which weren't that well taken up. What they like is the unexpected, the incidental movement, and conversations and bouncing off one another.”

The types of interactions described in the hubs helped attract talent and introduce entrepreneurs to staff. One entrepreneur described the serendipitous collisions at the innovation hub that led to the recruitment of his employee:

“When I first come here, John was a sales rep for a printer company. He always did programming on the side, but I never knew that. John was into hardware, so just a general chat to work out where his strengths are, and now John’s come on board, and we’re doing the development in house and writing all the code for the new hardware.”*

*Name changed

Respondents also acknowledged that roles in the innovation ecosystem were emerging and there could be a **lack of capability** and **low number of specialist skills** in delivery of innovation and entrepreneur support services. Roles, such as government, university, and chamber of commerce, each reflected on a lack of skills and capability in the local innovation hub, referring to activities in the hubs as *“theatre”* and *“being good at getting grant money but not being sustainable”*. Support from well-meaning innovation hubs and coworking spaces could be seen as a distraction by entrepreneurs, with one founder reflecting: *“I couldn't go to another coworking space because they were trying to mentor me constantly and they weren't as entrepreneurial. We don't need someone to come up and try and give a cuddle every day.”* Another entrepreneur mentioned needing *“more experts to reach out to who really are experts in their field and not just trying to flog their consultancy.”* In the absence of support, entrepreneurs were left to skill up on their own through trial and error:

“I've built it five times – three were colossal fuck ups, the first one prototype. I found a guy to do that locally. I went offshore for the first two, and I didn't understand the language. I didn't understand any of it, but I slowly got better at being able to translate what I wanted into technical terms to get people to build it for me.”

Efficient management of resources was realised through **resource sharing** between roles. Roles of industry associations and chambers of commerce partnered with innovation hubs for delivery of specialist accelerator programs and brought other roles together, including corporate and service providers to maximise resource use and impact. However, program

quality was impacted by limited resources in roles of innovation hubs, hackerspaces, and accelerator programs that provided innovation and entrepreneur support services. Time was spent on operational activity of running events, reporting to funding organisations, promotion and marketing, facility management, and general community engagement. This impacted time allocated to engaging with stakeholders, supporting member and participant entrepreneurs.

The limited resources meant that ecosystem service providers could suffer from **burnout**. As one local council noted of an innovation hub manager: *“She's here for many, many hours. I'm very conscious of not burning her out.”* Another hackerspace commented: *“it took me about 18 months to get burnt out. I think that was in large part due to inexperience and fumbling with what material to cover and how to deliver it.”*

An entrepreneur advocacy group identified a need to distribute capability across people rather than focusing on a single individual: *“It's often those few people inside that startup movement, and they're burning out. The capability is not wrapped in any single person. It's actually a quantity of capability on call.”* A contributing factor to burnout was high demand, with a creative hub noting the need to focus on fewer, higher quality initiatives:

“It feels like it's fragmented, ‘Let's quickly run over there and see what we can do with that’, with ten people coming in and saying, ‘we all want to do this’ and then going, ‘yeah, okay, let's do that.’ It's less about spreading everyone thin and more about concentrating on fewer events and maximizing the benefit.”

The high demand and low resources also meant there was a **low redundancy** of specialist innovation and entrepreneur support services. Support often relied on a single individual, and when the person left the services would stop. Interviewees shared about **limited professional specialist** skills related to high growth firms in local service providers. Local technology communities were reliant on volunteer efforts by a few individuals, and effort could *“wax and wane based on busy schedules”*.

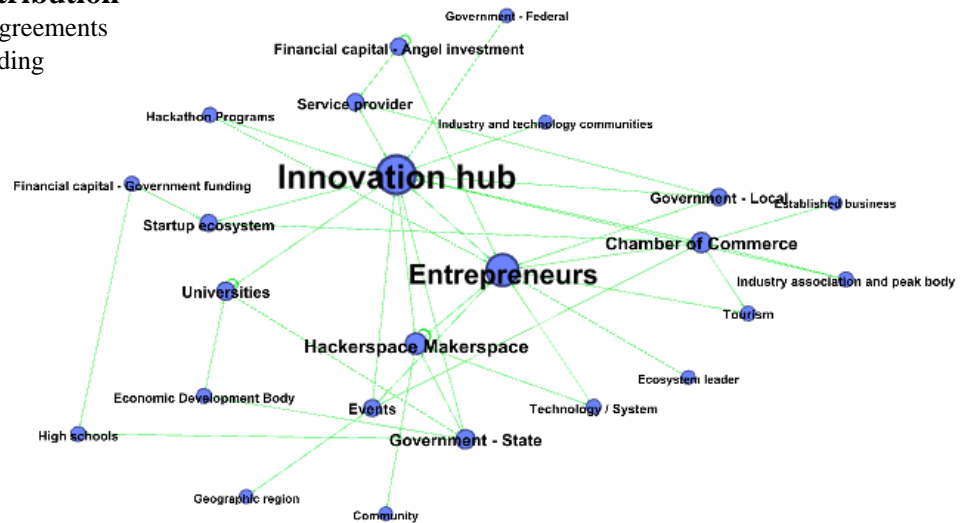
6.3.2.6 R&D

The Research and development (R&D) subdimension includes two indicators of “Innovation and technology update” and “Research (funds, facilities) on risks and academic-society collaborations”. Figure 6-14 outlines roles identified through interviews as enabling and inhibiting contributions to community resilience.

Innovation ecosystem contribution towards the R&D subdimension of community resilience

Enabling contribution

- Collaborative agreements
- Distributed funding



Inhibiting contribution

- Silos
- Competing interests
- Funding centralisation
- IP constraints



Figure 6-14 Innovation ecosystem contribution towards the R&D subdimension of community resilience

R&D was inherent to the innovation ecosystem through programs, funding, and physical spaces designed to develop new ideas and translate ideas into commercial outcomes through entrepreneurial activity. Formal and informal **collaborative arrangements** and **distributed funding** was described with roles including economic development bodies, industry associations, and innovation hubs encouraged collaboration between government, universities, and industry through programs outside of traditional research mechanisms such as

Collaborative Research Centres and CSIRO. The collaboration on R&D needed to balance **competing interests** from the rigidity of the institutions like universities and the need to remain profitable for innovation hubs and coworking spaces. This needed to be considered when funding innovation activity outside the institution. As one university described:

“It's best to partner. There's a role for the university as a coordinator or hub, but it is all those other people that bring what they bring to the table. Otherwise it's a hierarchy and there are power struggles. There's a role for coworking spaces. I also recognise there's problems with coworking spaces that unless they're sponsored from a government, it's got a different motive. Universities are wary that it isn't hijacked by people just trying to make money.”

Universities connect to innovation hubs through specific programs and events, but there were limited examples of a university connecting with other actors in the innovation ecosystem specific to research outcomes. This was the case even for innovation hubs owned by the university. In principle, university students would participate in innovation hub activities and research in the university would be commercialised through the innovation hub. In practice, leaders in both the innovation hub and the university commented that integration was *ad hoc*, **operated in silos**, and often depended on informal volunteer activity. This was a similar situation to innovation hubs owned by a local government with a lack of connection between the innovation hub and the economic development and community development strategies of the local government.

New roles could form if the barriers to R&D became too great, and there were sufficient demand and the presence of leadership capability. This was seen in an example of a hackerspace inside a university that provided equipment and tools for prototyping. The **control of IP** and bureaucracy resulted in managers in incubators owned by institutions such as universities creating hubs of their own, seeking external commercial models for rapid prototyping:

“I used to work at the university, and we had a brilliant workshop facility. We had a pipeline of clients at the innovation hub, and we wanted to do prototyping and R&D work for those clients on a commercial basis to help fund the facility and help fund the academic and research work. Everyone seemed really keen except for the lawyers. The model never really got off the ground. Then on the back of the frustration of that, I set

this place up. I got sick and tired of waiting for someone else to do it and I needed it. So I was like, 'I'm going after this' and that's why I went down this path."

6.3.3 Social and individual

The Social and individual dimension includes indicators related to community, relationships between people, and individual wellbeing. Subdimensions include “Community bonds, social support, and social institutions”; “Equity and diversity”; “Local and culture”; “Safety and well-being”; and “Social structure”.

6.3.3.1 Community bonds, social support, and social institutions

The Community bonds, social support, and social institutions subdimension includes the following indicators:

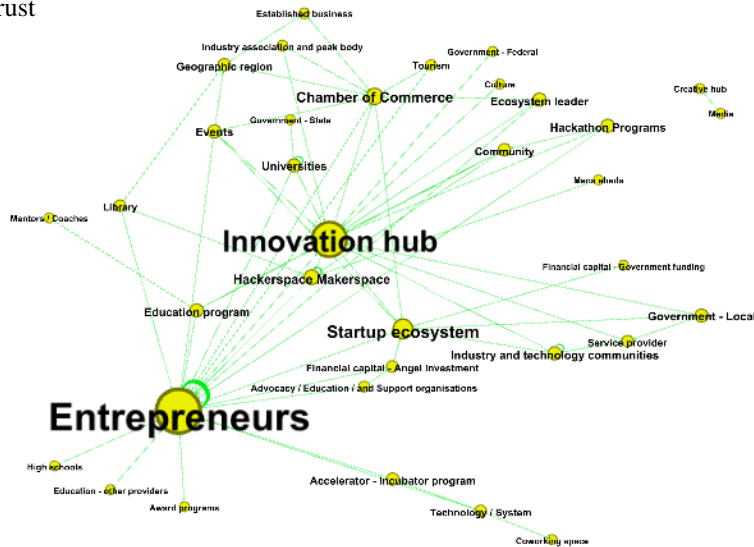
- Degree of connectedness across community groups
- Volunteerism and civic engagement in social networks
- Collective memories, knowledge, and experience
- Trust, norms of reciprocity
- Shared assets
- Strong international civic organisations
- Place attachment and sense of community pride
- Existence of conflict resolution mechanisms
- Empowerment and engagement of vulnerable groups, social safety-net mechanism

Given the connected nature of the innovation ecosystem, it is not surprising that all roles were identified in some way with the subdimension (Figure 6-15).

Innovation ecosystem contribution towards the Community bonds, social support, and social institutions subdimension of community resilience

Enabling contribution

- Clear accountabilities and responsibilities
- Cross-promotion
- Distributed leadership
- Diverse leadership capability
- Personal relationship and trust
- Integrated collaborative programs
- Progress or challenge focus
- Support specific challenges
- Third space



Inhibiting contribution

- Bureaucracy
- Focus on others at expense of self
- Systemic social barriers
- Lack of awareness or understanding
- Lack of capability
- Lack of funding
- Lack of leadership and direction
- Lack of trust / corruption
- Exclusive language
- Local competition
- Low perception of value
- Remoteness
- Resource intensive support
- Operating in silos
- Lack of common challenge



Figure 6-15 Innovation ecosystem contribution towards the Community bonds, social support, and social institutions subdimension of community resilience

Several enabling factors were identified to support the community bonds, social support, and social institutions subdimension. **Clear accountabilities and responsibilities** helped different roles work effectively together on programs and projects. **Integrated collaborative program** delivery helped clarify these accountabilities. Peak bodies acknowledged the value of the local university-managed innovation hub to support an industry-specific accelerator program. Service providers acted as mentors. Corporations provided challenges. Local governments offered funding and a focus on the local community. While there were many areas where this was communicated as not being the case, the ecosystem was enabled where there were clear accountabilities and integrated program delivery between roles.

Community bonds were enhanced through **cross-promotional activities**. The Queensland Chief Entrepreneur wore t-shirts of local startups. The state government's Advance Queensland program promoted regional ecosystem activity through online media and events. Local government-run media channels advocated for local startup activity and promoted their local innovation hub.

The local innovation hub also acted as a promotional channel for local members. These activities created a channel for promotion from the entrepreneur, through the innovation hub and programs, supported by government or university, and into media engagement with the wider community and startup ecosystem. Promotional activities increased awareness, cross-boundary connections, and built trust through advocacy from a trusted source in the community.

Decentralised and **distributed leadership** facilitated multiple points of access to entrepreneur and innovation opportunities. Local leaders were enabled with a common narrative and shared vision among roles, including the innovation hub, local government, university, hackerspace, service provider, and chamber of commerce. Entrepreneurs and innovators had local options of a provider (e.g., local government or innovation hub) experienced challenges with capacity, capability, or trust.

There is a need for **diverse leadership capability** across the region. Competencies in leadership capability that were identified include technical expertise, business competencies, facilitation and presentation skills, counselling and personal soft-skills, political nous, market intelligence, and networking and promotional experience. There was value in having these skills distributed across multiple actors and roles to mitigate a loss of a single individual and increase likelihood of filling the range of leadership functions in low density regions.

Another enabling factor was the presence of a **challenge or priority area** to focus the collective attention of all roles and increase connection to place. While some roles engaged in a general emphasis on economic diversification, innovation, or entrepreneurship, many respondents commented on engaging when there was a specific focus or challenge to solve. This could be a particular social issue (e.g., female or indigenous entrepreneurs), local buying campaigns, infrastructure challenges such as digital connectivity, or establishing a new role such as an innovation hub or local angel investor group. As described by a local innovation hub manager:

“Running the Random Hacks of Kindness hackathon was good to bring people from outside and introduce them to different ways of thinking and different ideas that make a social impact. You've got social entrepreneurs, service providers who help and give back and are linked with the chamber of commerce and with rotary.”

Having a dedicated **third space** also helped to bring people together under a common focus. The physical space and community were often synonymous, as described by a chamber of commerce referencing the innovation hub: *“people want a sense of community. They want to belong to something.”* Entrepreneurs found it important to have a common place that was not work or home and where people could find others with similar views and perspectives. When asked about the value of the local innovation hub, one entrepreneur said it was like finding *“my tribe, being with likeminded people and building something where no one was judging.”* Another entrepreneur described appreciating *“a space where I can come and be in community and work whatever else I need. It means the difference between me continuing and not.”*

Trust and vulnerability in personal relationships helped foster connectedness in the community and was often related to membership in a space or program. An investor described the value she saw in the innovation hub: *“a place like the innovation hub builds trust, gives a home for founders, gives confidence that they will stick the course and grit that investors are looking for, builds connectors investors are looking for.”* A peak body described the results of their accelerator program as counter-cultural to the Australian way:

“Because they've gone through that program together for three months, that whole trust and the vulnerability is important in hubs and clustering. It's important to encourage vulnerability because I don't know if it's a cultural thing in Australia, but it's almost like a badge of honour that you can do things on your own.”

Several inhibiting contributions were also raised related to the community resilience subdimension of community bonds, social support, and social institutions. Several of the inhibiting factors are the antithesis of enabling factors. The enabler can also be used to address the inhibitor or, conversely, the inhibitor mitigates the enabler. For example, the inhibitor of bureaucracy can be contrary to the enabler of distributed leadership, the inhibitor of lack of trust would not be experienced with the enabler of personal relationship and trust, and the inhibitor of remoteness can be mitigated by the enabler of a third space.

The inhibitor of **bureaucracy** describes situations where constraints within institutions and relationships with institutions related to slow processes, decision-making, and ‘*red tape*’. In one example, the structure of a local government did not align with what a mentor perceived as being needed when the local council took over management of the government-owned innovation hub, “*From a council people point of view, instead of being a full day after hours drop in to facilitate growth, it's a nine-to-five, log in, log out. We can't use that facility anymore. They've absolutely killed it.*” The correlation with bureaucracy and death was also shared by an entrepreneur describing the slow decision-making process of governments and corporations, who described their experience:

“The length of time, the number of conversations, the number of meetings. There are so many people you need to get on board, and they don't really understand. I'm having all these meetings. I'm not getting paid, I've got people chasing me to pay my bills...”

Another inhibitor to community bonds was a **lack of trust**, or an inability or lack of willingness to rely on another role or actor. A lack of trust was evident between entrepreneurs, a sentiment that was identified as competing with a ‘*give first*’ culture in the innovation ecosystem: “*I trusted someone with a lot of information about what I was doing. He has now gone and built the exact same thing and got the Federal endorsement. This whole ecosystem is about ‘give first, trust each other, build great community’ ...*”. The inherent trust in the ecosystem created opportunities for others to take advantage and introduce corruption. As one innovation hub respondent noted about the curation of mentors, “*There are business coach people around because they sniff around government money. There are dodgy companies who try and suck the money out of the government. There's room for corruption if it is loose.*”

The **remoteness** of the regions was also an inhibiting factor in connection and community as noted by one regional university: “*it's hard enough in a city when you have all the tools and all the assets that your disposal, so you throw in another layer of difficulty of remoteness on*

top of it.” The distance and low population were attractive for some from a lifestyle perspective, but also contributed to a difficulty in accessing talent and networks. As one large corporation described:

“The region is small, hard to get to. If you're in a relationship, one of the people might have the dream job, great pay, all the space in the world, see the stars every night. But if that other person in the relationship has a good job, can they both replicate it or is one of them taking a step back?”

Related inhibitors were references to **operating in silos** and self-interest and **local competition**. Some roles were observed as operating in silos and ‘protecting their patch’. When asked about this, a local angel investor commented that *“It's people trying to get a win for themselves. Different organisations have pressure around government funding; they've got to report on success. They feel that if other people are involved, that might dilute their role.”* Another ecosystem leader commented on the competition between new economic development models of innovation hubs and established providers such as chambers of commerce and local government, *“You've got competition with the new economy thinking from the traditional economic development people. Getting cohesion between all of those is very difficult, particularly when economic times are tough.”*

In addition to conflict between traditional models and new innovation programs, there was also perceived challenges with models that were funded by roles such as government and others that relied solely on membership revenue. As described by one chamber of commerce: *“They are scared they will pinch each other's members. There's competition between membership. Our income is membership, sponsorship, and any money we may get out of events. We don't get core funding from council.”* The issue was heightened in an example where a local government intentionally introduced subsidised competition to improve a perceived lack of quality in community-run programs: *“There needs to be a degree of competition so that everybody's lifting their game. We tried some things here with some fairly large players and unfortunately, they got diverted by other players protecting their own interests.”*

The Australian culture and lack of shared challenge was seen as contributing to a lack of cohesion and collaboration. The innovation ecosystem by its nature created a sense of a burning platform to mobilise activity. As described by a peak body that developed a program for local agriculture entrepreneurs:

“Because we're the lucky country we don't have burning platforms. But the founders looked at this region and said there is a huge number of small, artisan food businesses that are all facing the same hurdles as they try and scale for growth. These larger food businesses said if we share our collective knowledge and we share infrastructure, than we can support these businesses to address the challenges they're facing.”

The introduction of a **common platform or challenge** created a shared language to overcome differences in people groups, perspectives, and self-interest. Systemic social barriers that were communicated included those inherent to people groups based on gender, age, nationality, geographic location, and cultural background. These differences were reinforced by the use of **exclusive language** and a sense of elitism inherent to the innovation ecosystem. As one local government described innovation hubs supported by federal funding, *“I've got a bunch of growth centres set up by the federal government. I think they're incredibly elitist. I haven't seen much success out of them, very bureaucratic the way they run.”* A local government innovation hub would have similar criticism from a community-run hub. These perspectives came from several sources of an ‘other’ looking from the outside-in. An angel investor observed the local innovation hub, reflecting that *“pretty soon they've got a complete language that no normal person could understand.”* A regional ecosystem leader noted a distinction between metro and regional innovation:

“People here have been calling it business diversification for 10 years, where somebody else has been calling it innovation. It's probably the same thing. What time and churn is getting wasted in missed conversations because the language is different? From a rural community point of view, how do we make sure we don't need another set of words for people west, but we need to catch up and realize that innovation is happening in this community.”

With the innovation ecosystem being a relatively recent introduction, there was a **low perception of value** by many of the incumbent roles in the region, while innovation providers such as innovation hubs felt there was a lack of understanding by the general community. The lack of quality was acknowledged by the innovation leaders, noting that *“if an investor comes once and sees terrible pitches, they're never going to come back”*. Innovation leaders were also critical of other functions, as one leader reflected on an event by the local economic development body: *“the judges who were there were critical that it was a waste of their time because the teams just weren't prepared.”* One angel investor described the local entrepreneur

advocacy group as “*bunches of individuals trying to do things without any funding.*” A local chamber of commerce describing a pitch event as “*a little local competition*” and “*fantastic theatre*”, while another chamber of commerce described the local innovation hub as sitting around drinking lattes and only talking about starting businesses.

6.3.3.2 Equity and diversity

The subdimension of Equity and diversity includes dimensions related to differences between people groups:

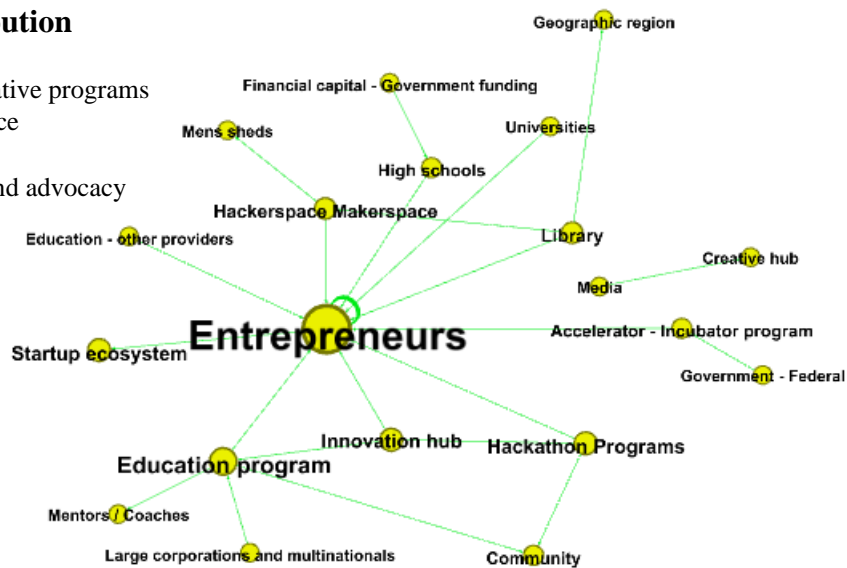
- Gender norms and equality
- Ethnic equality
- Involvement of minorities
- Involvement of population with special needs
- Diverse workforce in culturally diverse places
- Decency, affordability, and fair access to basic needs, infrastructure and services

Roles related to the subdimension identified specific comments that enabled and/or inhibited equity and diversity in community and people groups (Figure 6-16). These could be through dedicated programs, such as a female-focused accelerator, or through the inherent nature of the role, such as a men’s shed supporting mental health in men. Various levels of government were noted as supporting these activities. More traditional economic development functions such as chambers of commerce or economic development bodies were not raised as engaged in equity and diversity programs.

Innovation ecosystem contribution towards the Equity and diversity subdimension of community resilience

Enabling contribution

- Focused programs
- Integrated collaborative programs
- Dedicated third space
- Dedicated media
- Senior leadership and advocacy



Inhibiting contribution

- Lack of trust
- Bureaucracy
- Emphasis on high growth firms
- Systemic social barriers
- Language
- Lack of perceived value



Figure 6-16 Innovation ecosystem contribution towards the Equity and diversity subdimension of community resilience

Enabling contributions to the Equity and diversity subdimension focused on addressing inequalities between different groups of people and ensuring participation was representative of the population. The innovation ecosystem supports all innovation and entrepreneurial activity and did not overtly exclude segments of the community. However, there were aspects of innovation ecosystem services that would increase inequality by providing access to services

that would advantage core groups who already benefited from a societal advantage, while other groups would be disadvantaged due to **systemic or cultural barriers**.

For example, events and accelerator programs benefited those who had personal flexibility in time. Events in innovation hubs tended to happen in the evening when a single parent may not be able to attend, and accelerator programs required participants to be on-site for intensive sessions, requiring temporary relocation. A female entrepreneur who was a single parent commented on the inability to fully devote her attention to her startup and attend an accelerator program: *“If my personal circumstances were different, I could see myself doing it. I'm single with three kids, and I don't know if I could commit myself to that and because I've got another business that feeds us all.”*

The innovation ecosystem was perceived as having a specific demographic, typically males. Those who do not feel they fit in with the perceived target audience may not engage or feel excluded. A female entrepreneur felt that *“creepy old dudes was the vibe I was getting, not inspiring in the layout of the areas to work in.”* Gender and age bias were perceived in regional areas, with another female ecosystem leader commenting about gender perceptions:

“It is a male conversation. You're standing in front of seven other men, and they treat you like the secretary. It's hard to have engaging top-level discussions about how we can collaborate when you're seen as someone who's going to get water. That's one of the biggest barriers here.”

In reference to agism, the entrepreneur noted *“the perception that I get a lot from the community is like ‘You young kids, thanks’ as if we're working on Lego houses all day or something.”* A mentoring program manager responsible for supporting socially disadvantaged individuals commented on the barriers of people having the confidence to engage with a community characterised by *“black t-shirts, the skinny jeans, and the pitching”*.

Innovation hubs were perceived as having a focus on high growth, technology-enabled firms, while other programs and community groups catered for other audiences. One program provider described a community for individuals in manual trades: *“They are not going to turn up in the innovation hub in his mowing shorts. I would like to see more support targeted to those kinds of people. There is a networking group called trading mate that's a more informal networking and has encouraged more micros and tradies to come along.”* Without intentional efforts to address different people groups and create **integrated collaborative programs**, the innovation ecosystem could increase inequities and a lack of diversity in a region. As one

program provider that supported digital skilling of indigenous people noted: “*If you were an indigenous business, you might as well add another thousand layers to your business - community expectations, family expectations, cultural expectations...*” Support for different people groups required additional effort by service providers or **dedicated programs and spaces**. As one interviewee described,

“There might be aboriginal people, people with disability, people from other countries. They don't have the capacity and capabilities of someone ready for startup weekend. We are the ones that pick up those cohorts of people that need intensive and long-term support. We're teaching them how to manage their mental health to go with the requirements of that business.”

6.3.3.3 Local culture

The Local culture subdimension focuses on the historical and current culture of the region and includes the following indicators:

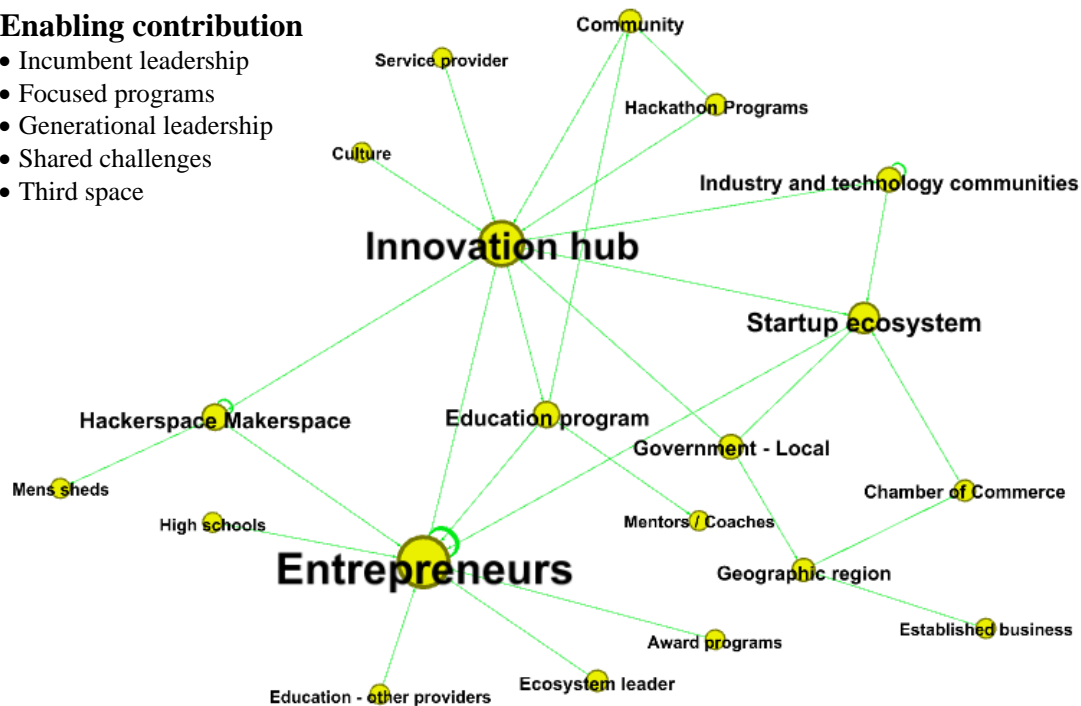
- Past experience with disaster recovery
- Learning from the past
- Culture and historical preservation; indigenous knowledge and traditions
- Considering and respecting local culture and specificities in the process
- Positive social, cultural, behavioural norms

The innovation ecosystem is comprised of incumbent actors that can reinforce established social norms and new entrants that bring diverse and potentially disruptive ideas and businesses into a region. The dynamics between the two types of actors provide both enabling and inhibiting contributions to community resilience. Roles attributed to enabling and inhibiting indicators are outlined in Figure 6-17.

Innovation ecosystem contribution towards the Local culture subdimension of community resilience

Enabling contribution

- Incumbent leadership
- Focused programs
- Generational leadership
- Shared challenges
- Third space



Inhibiting contribution

- Emphasis on high growth firms
- Systemic social barriers
- Low perception of value
- Attributing past failure to new models



Figure 6-17 Innovation ecosystem contribution towards the Local culture subdimension of community resilience

Leadership by incumbents and **cross-generational leadership** provided enabling contributions to local culture. Community leaders in government and corporations advocated for bringing in new ideas while respecting the wisdom and experience from the past. Older leaders who had been in community shared their stories and provided access to business connections for emerging generations, as shared by one ecosystem leader speaking of entrepreneurial activity in the tourism sector:

“I'm a bit old in the tooth to be doing that stuff myself, but I've got an opportunity to open some doors. The whole 67 years of my life has been wasted. A lot of the city leaders and politicians of the day are people I have known in my childhood. I have this opportunity to capitalize on that, to get things happening, to speak some positive things into our young people, get them away from the pubs and clubs and the drugs and the alcohol and wrong behaviour...”

Focused programs were a way to bring old and new roles and actors together around **shared challenges**. As one chamber of commerce commented: *“if you cry and bleed together in the trenches, it has a very cohesive outcome.”* These activities often occurred in a **third space**, such as an innovation hub, around pool tables, a local pub, through group sessions and events, and through diverse members sharing information. The activities within the innovation hub were seen as facilitating a positive conversation in the community and social norms about opportunity, as described by one leader who delivered entrepreneurial programs for prisoners: *“What we really want to see is empowered people running community positive businesses, employing other prisoners when they get out as well.”*

There were also inhibiting tensions between established incumbents and new entrants, as observed by both sides. The chamber of commerce was a long-established institution that could be challenged for relevance, with one chamber observing: *“we've really devalued chambers in Australia”*. This was reflected by a leader in an innovation hub: *“I think old school chamber of commerce do events and I don't see how it's helpful for the members here.”* Established incumbents **attributed past failures of similar activities**. The failure of a business enterprise centres was reflected on in relation to hesitation to engage with a newly created innovation hub.

6.3.3.4 Safety and well being

The Safety and wellbeing subdimension includes indicators relating to physical safety and security and individual physical and psychological health:

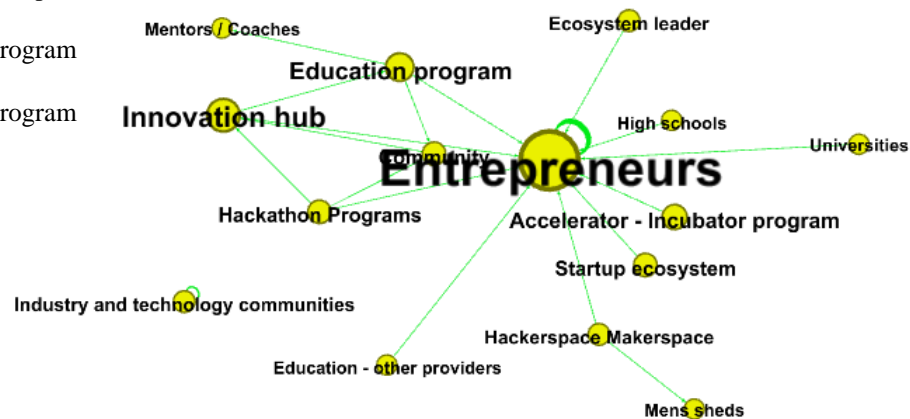
- Crime prevention and reduction
- Security services such as police
- Physical health
- Psychological health
- Preventive health measures
- Responsive health measures

The indicators relating to crime, security, and physical health were not considered to be directly impacted by the innovation ecosystem. Roles that were associated with influencing psychological health and preventive and responsive health measures are shown in Figure 6-18.

Innovation ecosystem contribution towards the Safety and well-being subdimension of community resilience

Enabling contribution

- Third space
- Personal relationships with leaders
- Community in program cohorts
- Community in program activities



Inhibiting contribution

- Role conflict
- Lack of capability
- Lack of capacity in ecosystem leaders
- Lack of resources

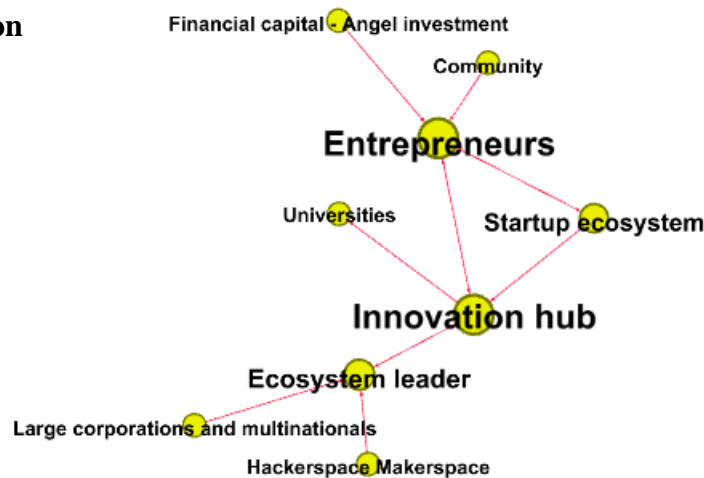


Figure 6-18 Innovation ecosystem contribution towards the Safety and well-being subdimension of community resilience

The innovation ecosystem supported personal safety and wellbeing, along with the health of the individual’s business. This was highlighted in narratives shared by innovation hubs and education programs as well as the entrepreneurs that benefited from the hubs and programs. One enabling contribution was through the **personal relationships with leaders**, as described by an innovation hub manager who indicated he felt like a psychologist when referring to

entrepreneurs needing someone to talk to when experiencing personal and business challenges. Another innovation hub manager shared a story about a founder's startup journey:

“One of my members had it tough recently. Something as small as me buying her flowers means so much. She feels that if she doesn't push herself to do something like she is, the result will be failure. Helping them to understand that ‘Yes, you, you are the be-all and end-all of the business, but you are not also the person who takes all of the pain and suffering of your failures.’ We are creating a community where people feel supported, and they don't feel like they're alone in that pain.”

Another enabler was the **activity** in the innovation ecosystem and the act of building a business. A hackerspace reflected on the value of men's sheds, stating: *“they're improving mental health by giving you a set of tools to work through. They work through their mental problems by being active.”* A regional entrepreneur commented on the value of an accelerator program in inspiring her and building confidence:

“I had never even been on a plane but I said I have to make this happen. I went to Sydney for about two years through the accelerator program and was able to benefit from having their impact in my life and building a business around my idea. You do crazy things when you're in regional Australia. You need to take it further.”

A program manager commented on participants from disadvantaged segments of society developing personal wellbeing: *“They're rebuilding their self-esteem and aspiration that they can achieve something positive, that they can contribute as positive members of society and while they're doing that, they're building their skills as well.”* Another founder commented on the act of pitching to overcome fear: *“I guess putting myself in front of fear, constantly pitching, doing things I'd never done before and trying to become a natural when you thought it was just turmoil.”* In reference to the support network, the entrepreneur reflected: *“I've got a safety net or someone that I can trust, and they understand where I'm at and what I'm doing.”*

The bonds created in community among common members and **cohorts** provided a normalising effect to address fear and what was referred to as ‘imposter syndrome’ – a sense of feeling like a fake as an entrepreneur. In addition to sharing a bond with fellow entrepreneurs, trust and vulnerability were enhanced by other cohort commonalities such as shared industry, nationality, life position, age, or gender. One entrepreneur who experienced a recent significant failure shared about the impact that a program with other female leaders had on helping her overcome mental health challenges:

“I really bottomed out in terms of mental health and then did a startup program. For the whole time I had the imposter syndrome and thinking ‘Oh my God, I don't deserve to be here.’ But meeting those women was so good. The program gave me the tools and inspiration to know I can pull myself out of that hole.”

Many individuals in the ecosystem held multiple roles. The roles were often voluntary or **under-resourced**. This combination inhibited wellbeing by increasing personal stress and facilitating burnout in those delivering ecosystem services. One ecosystem leader managed the local innovation hub and had their own startup. The leader commented on challenges of feeling guilty asking for help as an entrepreneur while feeling overcommitted to help others as an ecosystem leader:

“As a startup founder I'm needy and wanting more help than I felt worthy of or deserved, taking away from other people. As a community leader, managing time with limited resources, knowing the opportunities that were available, but not having the personal bandwidth or resourcing to do it.”

A leader in a university who volunteered to develop the local ecosystem shared a similar sentiment of role conflict: *“A lot of the things I've been doing for the past seven years have been volunteer-based. The challenge of that is that you experience burn out after a time added to a university career perspective.”* Another manager of a hackerspace commented on challenges of maintaining a fulltime role, a family, and the work in the hackerspace: *“Unfortunately I've worked full time and I've got a baby now. This is very much a volunteer thing I do outside of hours.”*

A lack of capacity in ecosystem leaders and those who delivered ecosystem services could then impact on entrepreneurs needing support. As one program provider observed, *“Different environments are daunting for people. If they're struggling with mental health issues, going into an environment that may not be as supportive can be detrimental.”* The delivery of ecosystem services is an emerging field. Leaders and practitioners often did not have previous examples from which to learn. Supporting others while at the same time struggling to support themselves could have a significant impact on the leaders and carry through to the community. As one innovation hub manager noted:

“Even if you believe that you will be really careful and realistic with the financial situation and know it's not your individual responsibility to achieve these outcomes, if

you don't have people on board at the same time, maybe you need to slow it down for a little bit. I'm very jaded at this point.”

6.3.3.5 Social structure

The Social structure subdimension is described through the following indicators:

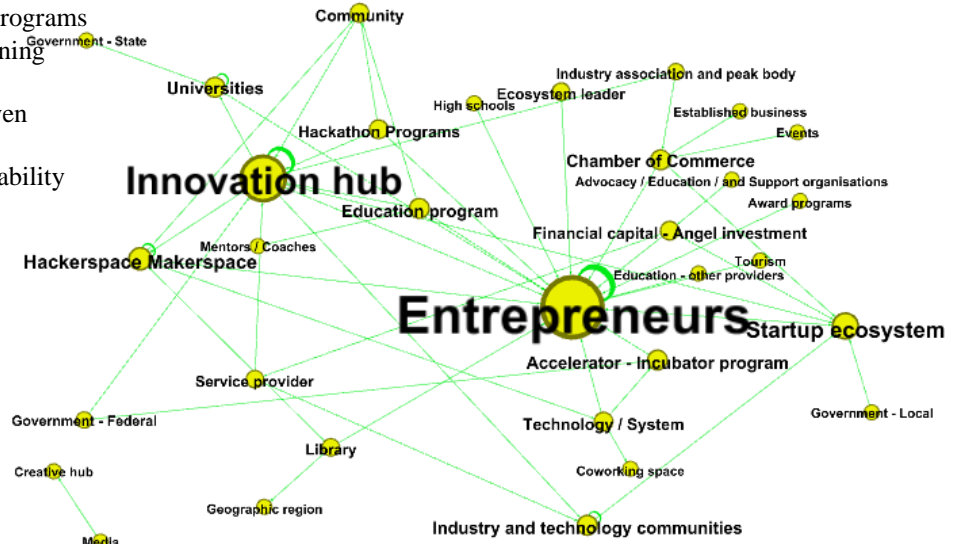
- Population composition
- Diverse skills (to pool skills at time of disaster)
- Language abilities
- Car ownership, mobility
- Land and home ownership

The two indicators of “Car ownership and mobility” and “Land and home ownership” were not considered as a contribution of the innovation ecosystem towards community resilience. The contribution of the innovation ecosystem to skills diversity impacted most roles, and population composition and language abilities to a lesser extent (Figure 6-19).

Innovation ecosystem contribution towards the Social structure subdimension of community resilience

Enabling contributions

- Third space
- Collaborative programs
- Boundary-spanning programs
- Innovation-driven corporations
- Leadership capability building



Inhibiting contributions

- Exclusive language
- Lack of redundancy
- Local competition
- Low perception of value
- Lack of local collaboration



Figure 6-19 Innovation ecosystem contribution towards the Social structure subdimension of community resilience

The innovation and entrepreneurial journey by its nature introduce diverse skills and new languages and introduces new people groups to the region. Much of this activity is enabled through **third spaces** like innovation hubs and hackerspaces and facilitated through **collaborative programs** and community groups. A service provider who established a meetup

group inside an innovation hub described themselves as “*a connector to place, we understand the business through to the developer and across a lot of those different sectors*”.

Entrepreneurs developed technical and personal skills, going on a journey that founders described as moving from ‘*wantapreneur to entrepreneur*’. The process was enabled by having a central place that provided support, access to networks, and encouragement. Two brothers found an opportunity to advance their skills and work together when they won a locally run hackathon: “*We were only expecting it to be a weekend, have a bit of fun and try some new ideas. My brother and I went along to see what we can produce together*”. A young man from the Congo participated in an accelerator program in a local high school delivered by the innovation hub with mentoring performed by local leaders. The resulting social enterprise that was developed involved clothing design and overseas manufacturing. Proceeds from the business were sent to fund medical aid in his home country of the Congo. That process introduced each person in the local supply chain to new ways of thinking and opportunities outside the region.

Larger corporations also enable diversity and skills in their local supply chains. As companies acquire and develop new technologies and innovative processes, there is a need for local service providers to increase capability to support the work. As described by one large national company with a regional location: “*The local trades for us from plumbers, electricians, earth moving companies, refrigeration component, there's a massive resource there that we're pulling all the time.*”

The innovation ecosystem can be seen as separate and unique to other community development and economic development activities in the region. This can be helpful in attracting attention and differentiating the approach, but it can also be exclusionary and limit it to those who understand the language. An investor commented on individuals in an innovation hub with **exclusive language**: “*they've got a complete language that no normal person could understand*”. A creative hub described the scenario of expanding the language over time to allow other leaders to step in:

“I think in five years we'd actually use different words. I call it regional development and learning, we will actually have our own terms. Then it can be paying for itself and it won't need the individual at the centre so when the individual drops there's individual two point zero ready to step in.”

The innovation ecosystem can inhibit social structure through **local competition** and **low perception of value**. Competitive tension between local innovation support providers combined with limited resources available for cross-role collaboration impacts on awareness and access for skilling opportunities. Members of a chambers of commerce would not be made aware of programs in an innovation hub and a low perception of quality of innovation hub services would be promoted in the region. The same situation was communicated for the innovation hub referring to the chamber of commerce, and between other roles such as economic development bodies, universities, and government.

6.3.4 Economic

Interview comments identified with the Economic dimension of community resilience focused on aspects of the economic security, dynamism, and structure of the region, institutions, and individuals.

6.3.4.1 Security

The Security subdimension included indicators related to economic savings, stability, planning, and security. The two indicators of “Insurance” and “Stability of property value” were not considered as being directly influenced by the innovation ecosystem.

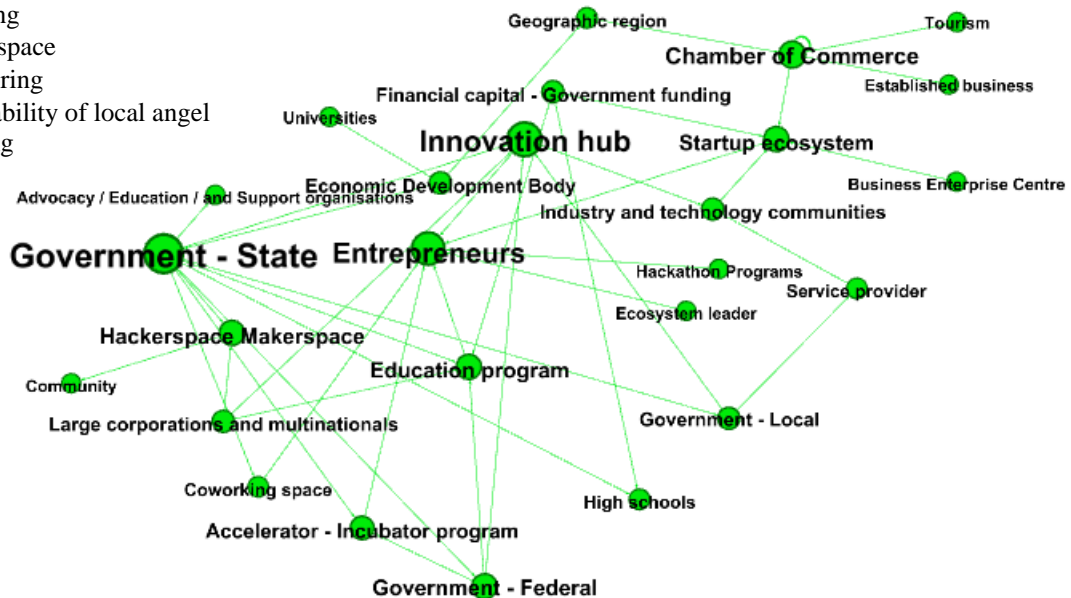
- Individual and community savings
- Collective ownership of community resources
- Business mitigation, response, and redevelopment plan
- Insurance (domestic and non-domestic) and social welfare
- Financial instruments (Contingency funds, operating funds, capital funds, etc.)
- Stability of prices and incomes
- Stability of property value

Roles associated with the Security subdimension are identified in Figure 6-20.

Innovation ecosystem contribution towards the Security subdimension of community resilience

Enabling contribution

- Engage established businesses
- Additional support for early stage founders
- Funding
- Third space
- Mentoring
- Availability of local angel funding



Inhibiting contribution

- Operating in silos
- Remoteness
- Bureaucracy
- Lack of funding
- Lack of capability
- Lack of sustainable business model
- Lack of service provider curation / availability
- Lack of program follow-through
- Cost of startup support
- Low perception of value

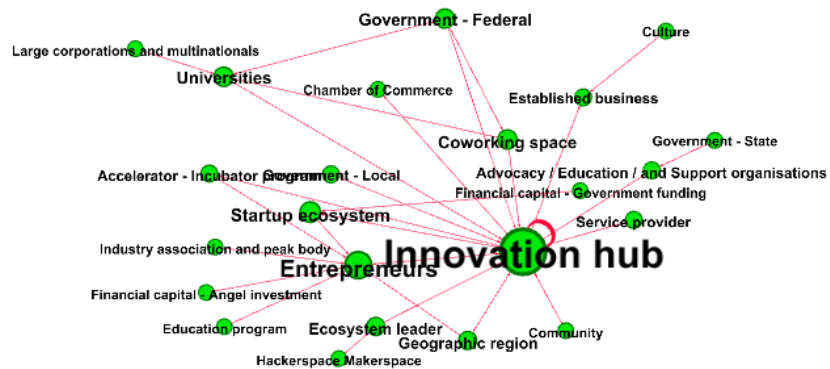


Figure 6-20 Innovation ecosystem contribution towards the Security subdimension of community resilience

Economic security could be seen as contrary to a high-risk activity of innovation and entrepreneurship, as exemplified by stories from entrepreneurs about losing savings from the failure of business endeavours. However, many entrepreneurs subsequently saw their efforts as an investment in learning and long-term financial security and freedom gained from running

their own business. The innovation ecosystem acted as what one entrepreneur described as a ‘*safety net*’, providing a community and support network to mitigate risk.

In addition to **supporting first-time founders**, economic security was enabled through **engaging established businesses in entrepreneurial activities** often through groups such as a chamber of commerce or business enterprise centre. Owners of established businesses had experience in business management, existing business networks, and existing cash flow to fund new business endeavours. New business endeavours were seen as a means to diversify income or mitigate against disruption of existing operations.

The innovation ecosystem’s financial and **mentoring support** compensated for first-time founders’ lack of experience, financial capital, and networks. The support capital and networks were often accessed through **third spaces**, such as innovation hubs. As described by one innovation hub describing the entrepreneur’s journey: “*You see how much they wanted it, but they have to overcome all of their insecurities and concerns to achieve what they need to make a living.*” The role of financial capital required training and capability building as much as entrepreneurs. A local angel investment interviewee described the perceived availability of local capital while needing to **develop capability in local emerging angel investor groups** with further training. There could also be a misalignment between the availability of capital and ideas the investor is interested in investing. “*We found out that there aren’t that many viable pitchable ideas on tap. Finding the capital is easier than finding the pitchable ideas. It’s taken a while for the capital to get their head around how this whole angel investing thing works.*” This sentiment contrasts the views of the entrepreneurs who felt there was a **lack of local equity capital**: “*I just want a small bit of working capital. The capital is missing. Equity capital is even smaller than that. The ability to scale with investment is missing.*”

The innovation ecosystem was described as ensuring the entrepreneurial path was as efficient as possible, providing access to information, networks, and financial support for entrepreneurs. But these support activities could also inhibit economic security. Examples identified through the research included entrepreneurs spending personal savings when local angel investors did not follow through, consultant service providers taking advantage of early-stage founders to spend government funds, and delays in approvals from bureaucratic government agencies and corporate funders and customers. Providers of support services, such as innovation hubs and accelerator programs, were often in a similar situation as entrepreneurs, creating their business

from personal savings while attempting to establish a business model funded by government or corporate financial support.

Early stage entrepreneurs that did get support through accelerator programs or sponsorship of innovation hub membership could ‘graduate’ but **not have follow-on support** for the next stage of their business. Much of the early-stage support in the innovation ecosystem focused on acquiring customers, business models, and sales, but could be limited in basic business management. As described by a local investor about services provided by the local innovation hub:

“They’re giving them that initial framework. Then they’re ready to need that first round money after the friends and family and fools. That’s where we come in. We’re part of the same pipeline. We haven’t had a great deal flow in the last 12 months. A lot of the businesses, they’re not quite ready for angel investment.”

Further, innovation activities could be focused on participation, community, and quality of the graduation presentation at the expense of the quality of the business at the end of the program. This condition was more significant in regional areas where there was often only one innovation support role, such as an innovation hub or ecosystem leader. The services provided could be limited to the networks and capabilities of the individual managing the program or hub.

A lack of funding and sustainable business models for ecosystem support providers further inhibited expansion and maintaining services. Funds provided to accelerator programs, innovation hubs, and coworking spaces were sufficient to deliver programs, but there was little remaining to reinvest in expansion to other services to support entrepreneurs or businesses at different stages of their journey. Government grants could be used for initial hardware assets, such as in the form of equipment in a hackerspace. The space managers would still be left looking for further investors to support the operational costs often without a clear business model. As one hackerspace manager described: *“Everything in here is bought via the grant, and there’s a fair amount that I contributed of my own. This is now a community resource that’s available..”* There could be a heightened awareness or establishment of early-stage businesses without realising the potential of the new businesses to create employment in the region and economic security for entrepreneurs, as described by a local ecosystem leader: *“I think they lost a little bit of momentum because they didn’t have funds to develop content, but there was some awareness out there at least.”*

6.3.4.2 Dynamism

The Dynamism subdimension focuses on role relationships and structures related to economic diversification. The indicators below, excluding “Investment in green jobs and green economy”, were considered in the research:

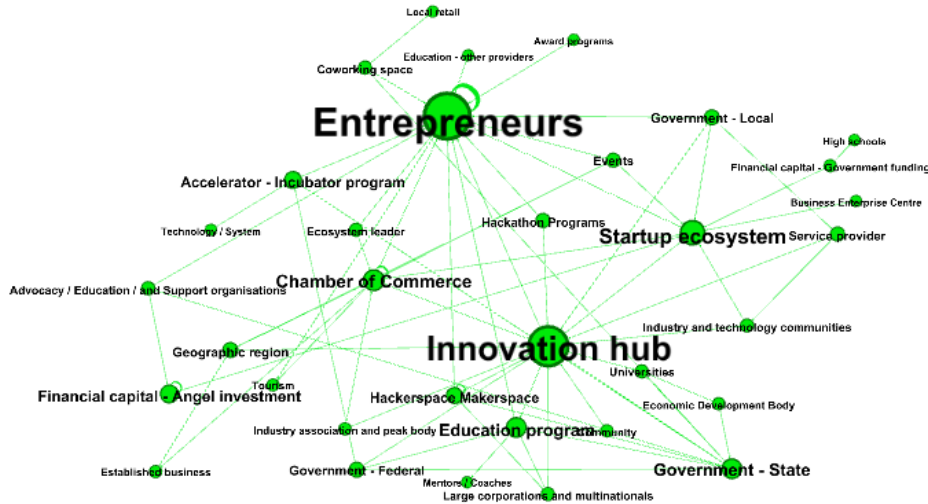
- Inward investment
- Investment in green jobs and green economy (self-sufficiency, urban farming)
- Connections with regional economy
- Business cooperation (inter)
- Business cooperation (Intra)
- Diverse economic structure and livelihood strategies
- Openness to micro enterprises and micro-finance services, entrepreneurialism
- Public-private partnership
- Private investment
- Locally owned businesses and employers
- Balance of local labour market supply and demand

All roles in the innovation ecosystem were identified in interviews as relating to the Dynamism subdimension (Figure 6-21).

Innovation ecosystem contribution towards the Dynamism subdimension of community resilience

Enabling contribution

- Engage established businesses
- Additional support for early stage founders
- Funding
- Third space
- Mentoring
- Specialist focus
- Integrated collaborative programs
- Intermediary role between cultures



Inhibiting contribution

- Lack of startup focus
- Low perception of value
- Local competition
- Lack of motivation in Australian culture
- Lack of reporting
- Operating in silos
- Remoteness
- Bureaucracy
- Low perception of value
- Lack of funding
- Lack of capability
- Lack of sustainable business model
- Lack of specialist focus
- Lack of service provider curation / availability
- Lack of program follow-through
- Lack of access to talent

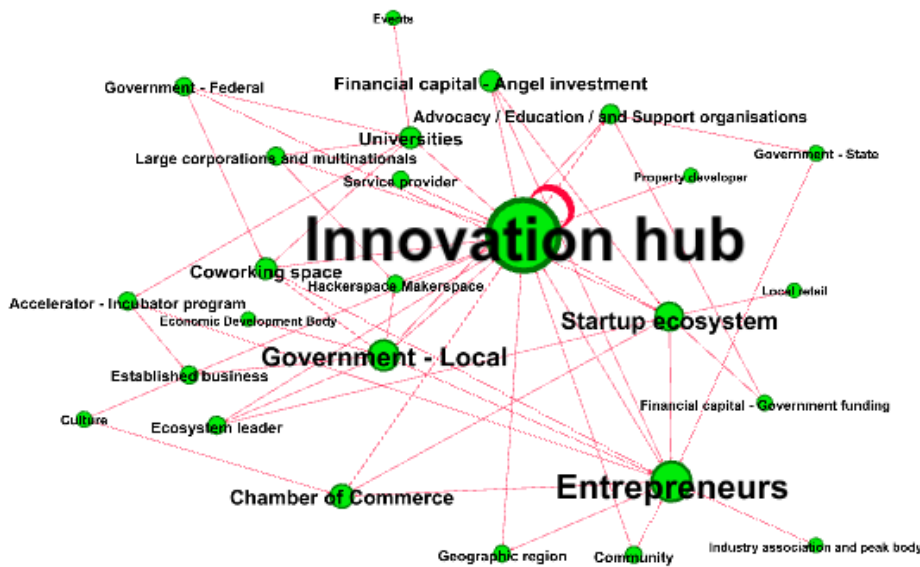


Figure 6-21 Innovation ecosystem contribution towards the Dynamism subdimension of community resilience

Economic diversity was a desired and observed outcome of the innovation ecosystem. A peak body commented: *“there needs to be a diversity of sectors in these regions that have a narrow reliance on such a narrow economic base.”* Local governments cited diversity as the reason for investing in innovation hubs and establishing public-private partnerships through accelerator programs. Innovation hubs owned by local governments, universities, and peak bodies’ had the potential to facilitate diversity and cooperation within their respective institutions.

However, differences were observed by interviewees between the cultures of the innovation activity and the sponsoring institution. A boundary-spanning intermediary function enabled interaction between the roles. This could be in the form of a department that managed administrative tasks on behalf of the hub and often involved an individual that buffered the hub from bureaucracy of the institution while also providing governance support for the hub. As one manager of a government-owned innovation hub described,

“I have my guiding principles and they are not local government principles. My guiding principle is to create the right culture, which is very much founder-first, ‘give first’, inclusive...”

Collaboration between spaces and innovation support providers helped define areas of specialisation within a region. Different approaches in innovation and entrepreneur support services facilitated greater diversity in entrepreneurs using those services. An innovation hub described how the spaces provided options to entrepreneurs in one region:

“Everyone's fallen into their own kind of space or dynamic. We've got the tech hub, a space which is a little bit more corporate and a bit more of the office style, there's another space that's more creative, a new space for retail coworking. Everyone's found their niche in the market, and we try and keep in contact as much as we can. We're running a collective, coworking accommodation trial so that you can come up here, have a holiday, and your coworking included as part of your holiday. As a group, we know that diversity is key. You can't just have one space.”

Some degree of population and support service density was required to facilitate dynamism. This was not always possible in low population regions. An investor commented on the challenges with a lack of diversity in service providers: *“Being a smaller community, we tend to have one or two people in any space that you can contact. If you want insurance or whatever, we'll either go to this guy or you go to that guy. Sometimes there's only just one guy to go to*

and that's it.” As noted previously, innovation hubs provided value by curating mentors and service providers. A lack of diversity in service providers reinforced perceptions of low quality of hub services held by other roles in the region. This could be compensated by collaboration with service providers and mentors to source support from outside the region.

Innovation support activity in low population regions was often facilitated by a primary sponsor, such as a local government or university. This had the benefit of creating a main program or asset, such as a local government-owned innovation hub that could inspire and prompt other activity. The activity could also inhibit other actors from participating and displace community-led efforts. An investor commented in one region about the government-run innovation hub displacing the local entrepreneur advocacy group: *“The group ran out of energy around the same time the idea of the innovation hub became important. People noticed we needed an address for small businesses to have a chance to get themselves up and running.”*

A tension existed between proponents of an exclusive focus on technology-driven startups or industry sector innovation and a more generalist approach that was available to all businesses. Roles (e.g., accelerators, innovation hubs) that preferred an exclusive and specialist focus saw the benefits of introducing new professions and new industries to the region. An accelerator clearly explained the distinction:

“Supporting small businesses makes no economic sense. If you make the hairdresser more successful by making them digitally enabled and upskilling them and making them entrepreneurially wired, they are only successful at the expense of the other three hairdressers in their suburb.”

This view was different from others, often incumbents in the region, who encouraged a more generalist perspective. A local investor who was also an accountant in the region shared a competing perspective: *“I think it should be a broad church open for all. However, given the nature of where we are and what the region’s known for it should have a focus of being like the AgTech capital.”* A local university shared a similar generalist perspective: *“I think to focus just on that would be to the detriment of other innovators in other areas.”*

Many of the inhibitors that impacted other subdimensions of community resilience also impacted economic dynamism in a region. A **lack of program follow-through** or **absence of early-stage support** meant that a region might only focus on established or growth businesses or early-stage companies at the exclusion of other business stages. A **low perception of value**,

a **lack of motivation in the Australian culture**, and **silos** were communicated as inhibiting both incumbents and new business communities in economic diversification.

6.3.4.3 Structure

The Structure subdimension of community resilience describes the population in terms of qualifications, competency, income, age, and employment. These aspects are captured in the following subdimension indicators:

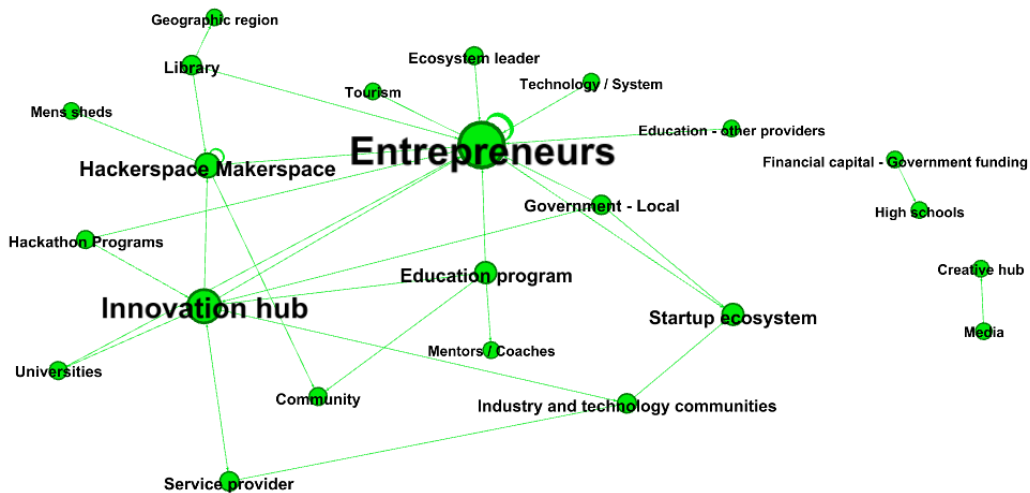
- Employment rates and opportunities
- Income (equality, multiple sources), poverty
- Age structure of working population
- Qualifications of working age population
- Individuals with high and multiple skills; literacy (education)
- Job density (housing-work proximity; extent of out-commuting)

Roles and contributing factors to the Structure subdimension are outlined in Figure 6-22.

Innovation ecosystem contribution towards the Structure subdimension of community resilience

Enabling contribution

- Engage established businesses
- Additional support for early stage founders
- Funding
- Third space
- Mentoring
- Focused programs
- Integrated collaborative programs
- Dedicated third space
- Dedicated media
- Senior leadership and advocacy



Inhibiting contribution

- Cost of startup support
- Operating in silos
- Remoteness
- Bureaucracy
- Lack of funding
- Lack of capability
- Lack of sustainable business model
- Lack of service provider curation / availability
- Lack of program follow-through
- Lack of trust
- Emphasis on high growth firms
- Systemic social barriers
- Language
- Lack of perceived value

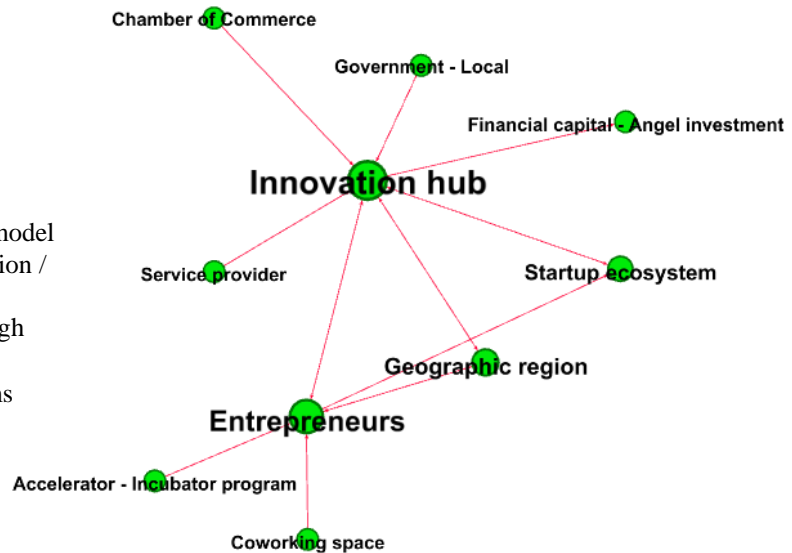


Figure 6-22 Innovation ecosystem contribution towards the Structure subdimension of community resilience

The innovation ecosystem was identified as both enabling and inhibiting the economic Structure of the region. The innovation ecosystem enabled employment rates and opportunities through new businesses creating new forms of employment and through introductions in innovation hubs connected entrepreneurs to employees. The innovation ecosystem also acted as an inhibitor to employment as many first-time founders left full-time employment or reduced hours from paid employment to pursue their new business while not paying themselves as they started their business. Entrepreneurs spoke of pursuing additional income from new opportunities and developing multiple income streams. Innovation hubs and programs provided pathways out of poverty for low-income segments of the community.

Without a specific direction towards equality, however, the innovation ecosystem also provided opportunities for established businesses and incumbents to increase wealth gaps. Perceptions of a lack of inclusion also presented barriers to specific people groups that did not align with the assumed young, male, technical entrepreneurs of the innovation ecosystem. Innovation hubs could be seen as focusing exclusively on high-value projects, leaving entrepreneurs with a social impact or creative focus feeling excluded. As one entrepreneur described the local innovation hub:

“It equates value with money. I think that's problematic. There are a lot of players who are brilliant, innovative, creative, world-leading people who will never be on that radar, and many of them choose not to be on that radar. It's a very limited sort of framework.”

The locality of the innovation ecosystem and specifically local incubators provided opportunities for housing-work proximity. A lack of diversity in the ecosystem, however, meant that entrepreneurs and supporters felt a need to leave the region to access knowledge, skills, and opportunities. Collaborations between universities and innovation hubs had the potential to connect students with qualifications to entrepreneurial opportunities, but qualifications were not required and at times deemed unnecessary for entrepreneurial activities. The innovation ecosystem addressed structural gaps through dedicated programs for underserved aspects of the community, such as youth, low-income communities, or artists.

6.4 The contribution of the innovation ecosystem to community resilience

The discussion in Section 6.2 provided an understanding of the potential for the innovation ecosystem to influence dimensions of this characteristic in enabling and inhibiting ways.

Figures 6-23, 6-24, 6-25, and 6-26 provide a summary of the enabling and inhibiting factors on the subdimensions of community resilience.

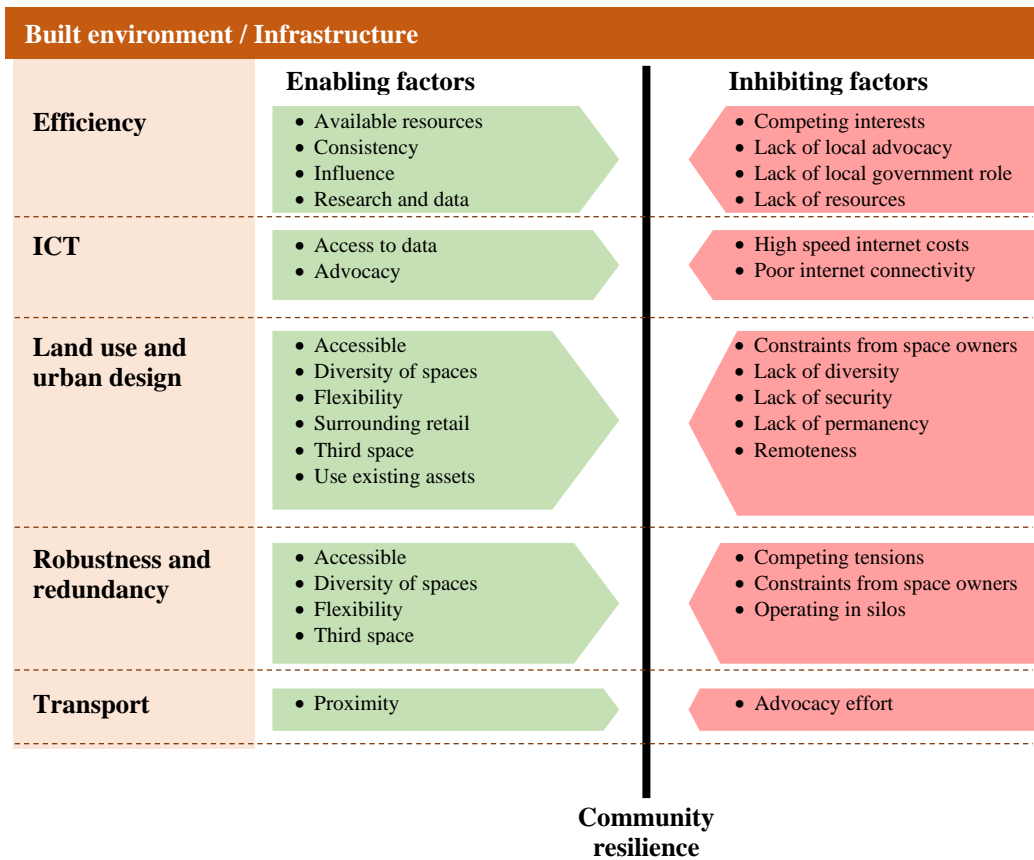
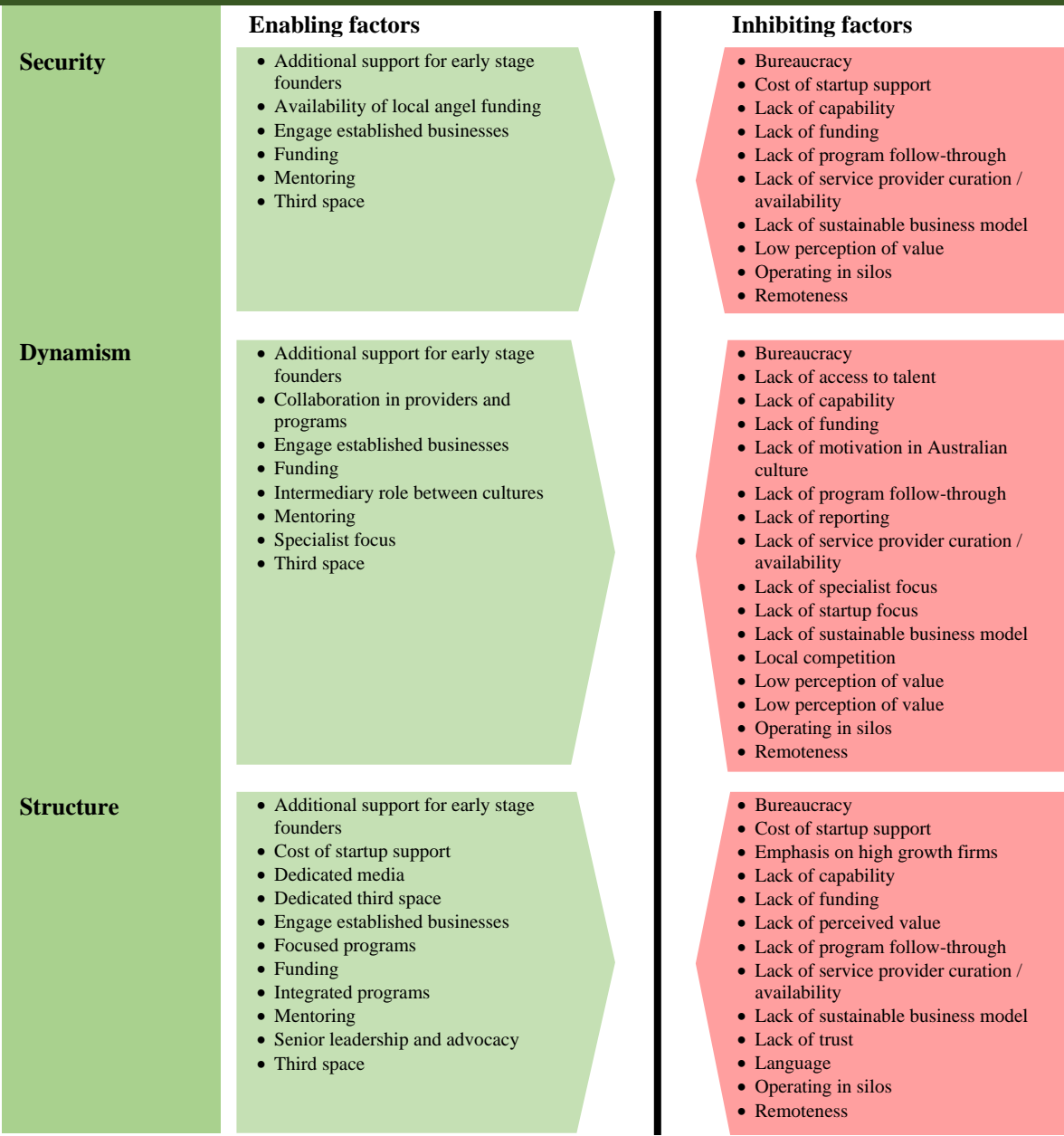


Figure 6-23 Summary contributing factors for the Built environment / Infrastructure dimension of community resilience

Economic



Community resilience

Figure 6-24 Summary contributing factors for the Economic dimension of community resilience

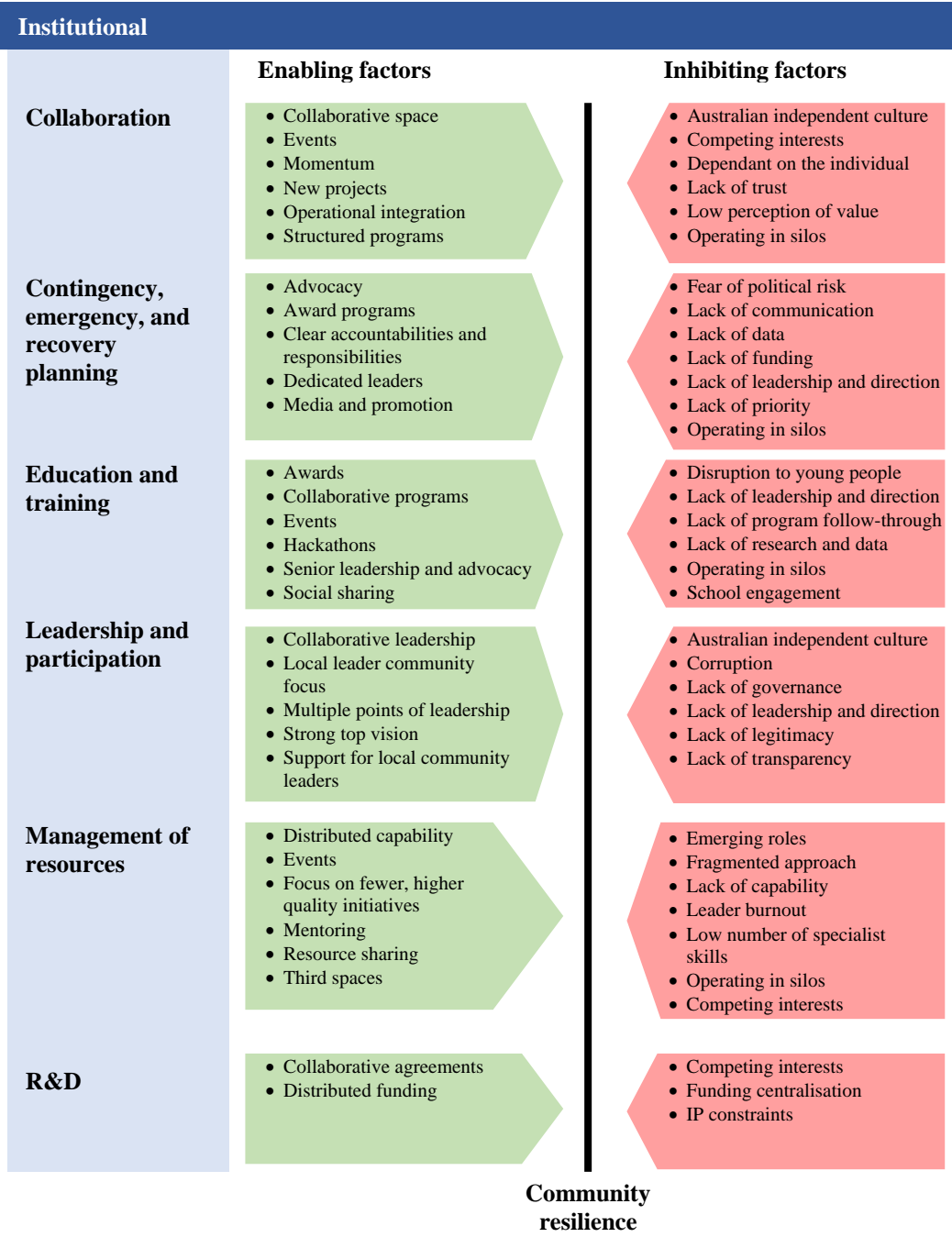


Figure 6-25 Summary contributing factors for the Institutional dimension of community resilience

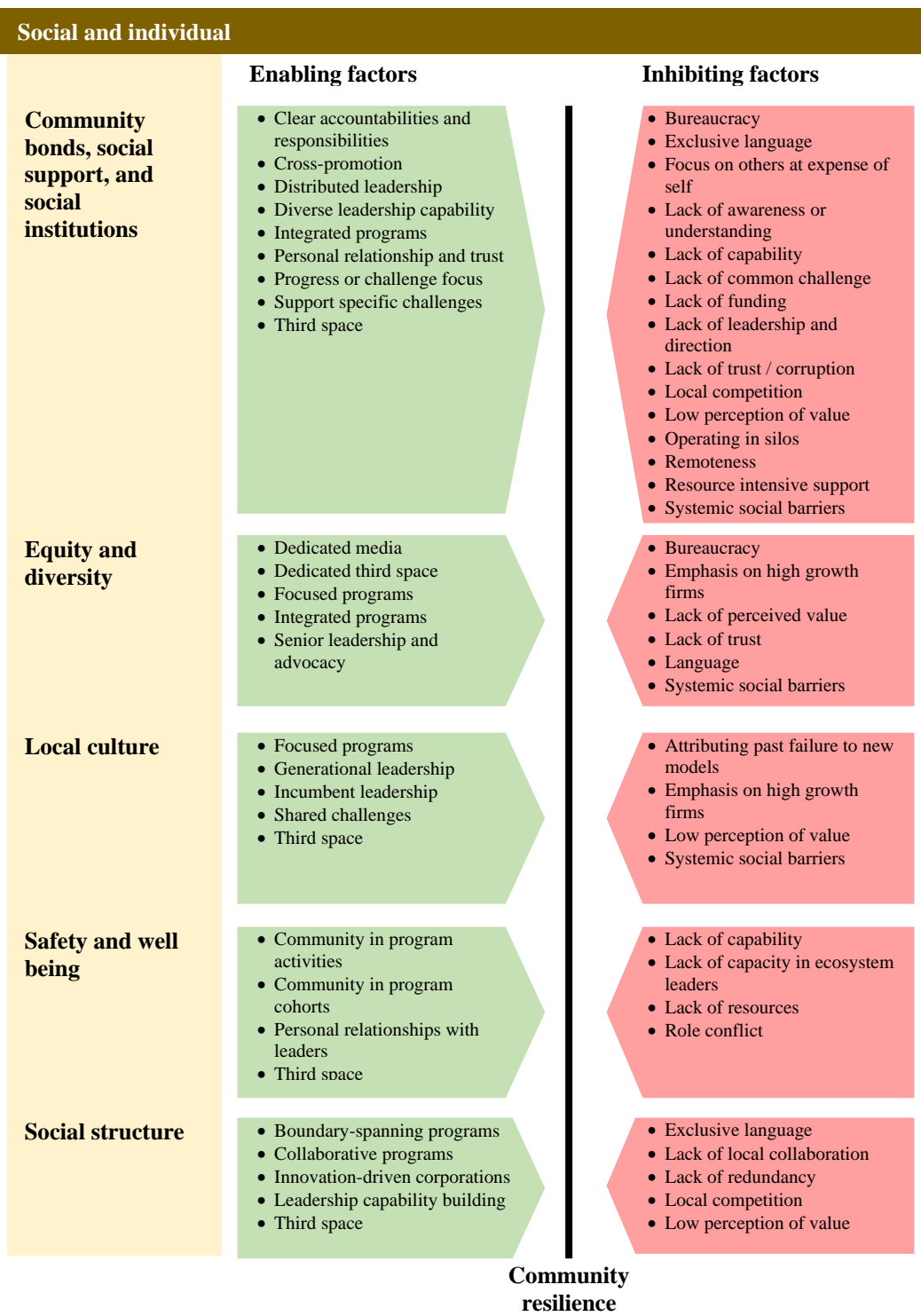


Figure 6-26 Summary contributing factors for the Social and individual dimension of community resilience

Some contributing factors are unique to a given subdimension, such as the inhibiting factor of “high-speed internet costs” on the Infrastructure subdimension of ICT. Other contributing factors are shared across multiple dimensions, such as the inhibiting factor of “operating in silos” or enabling factor of “third space”. While contributing factors were associated with certain roles from the interviews, the contributing factors are presented as applying to the

innovation ecosystem overall. Taking an agnostic approach to attributing results to roles aligns with the actor network theory approach that presumes actors are defined by the functions serviced rather than prescribing functions based on the role definition. This allows for actors filling a number of known and emerging roles. For example, while “Strong top leadership” may have been attributed as an enabling factor for the role of local government in one region, the factor may be seen in new emerging leadership roles in other regions. The inhibiting contribution of “Lack of redundancy” for the Social structure subdimension may have been attributed to service providers in the interview data, but the factor applies to many other roles in low density areas.

The designation of a contribution as an enabler or inhibitor of community resilience is based on the experience of the interviewee at the time of the interview. This research acknowledges that what may be perceived as an inhibitor by one actor may be an enabler by another actor. For example, a local government may feel that increased incubator competition be support Economic “Dynamism” in the region, while a community-run innovation hub may see the same act as an inhibitor of institutional “Management of resources” due to a factor of “Competing interests” and “Leader burnout”.

A full list of enabling and inhibiting contributions to community resilience is outlined in Figure 6-27. Many factors are related, such as “Personal relationships and trust” and “Personal relationship with leaders”. However, the application of the contribution from the data was unique enough to maintain a separate code.

Community resilience dimensions						Community resilience dimensions			
Built environment / Infrastructure	Institutional	Social and individual	Economic	Enabling contributing factors to community resilience	Inhibiting contributing factors to community resilience	Built environment / Infrastructure	Institutional	Social and individual	Economic
				Accessible	Advocacy effort				
				Additional support for early stage founders	Attributing past failure to new models				
				Advocacy	Australian independent culture				
				Availability of local angel funding	Bureaucracy				
				Available resources	Competing interests				
				Award programs	Constraints from space owners				
				Awards	Corruption				
				Boundary-spanning programs	Cost of startup support				
				Clear accountabilities and responsibilities	Dependant on the individual				
				Collaboration in providers and programs	Disruption to young people				
				Collaborative agreements	Emerging roles				
				Collaborative leadership	Emphasis on high growth firms				
				Collaborative programs	Exclusive language				
				Community in programs	Fear of political risk				
				Consistency	Focus on others at expense of self				
				Cross-promotion	Fragmented approach				
				Dedicated leaders	Funding centralisation				
				Dedicated media	High speed internet costs				
				Dedicated third space	IP constraints				
				Distributed capability	Lack of access to talent				
				Distributed funding	Lack of awareness or understanding				
				Distributed leadership	Lack of capability				
				Diverse leadership capability	Lack of capacity in ecosystem leaders				
				Diversity of spaces	Lack of common challenge				
				Engage established businesses	Lack of communication				
				Events	Lack of data				
				Flexibility	Lack of diversity				
				Focus on fewer, higher quality initiatives	Lack of funding				
				Focused programs	Lack of governance				
				Funding	Lack of leadership and direction				
				Generational leadership	Lack of legitimacy				
				Hackathons	Lack of local advocacy				
				Incumbent leadership	Lack of local collaboration				
				Influence	Lack of local government role				
				Innovation-driven corporations	Lack of motivation in Australian culture				
				Integrated programs	Lack of perceived value				
				Intermediary role between cultures	Lack of permanency				
				Leadership capability building	Lack of priority				
				Local leader community focus	Lack of program follow-through				
				Media and promotion	Lack of redundancy				
				Mentoring	Lack of reporting				
				Momentum	Lack of research and data				
				Multiple points of leadership	Lack of resources				
				New projects	Lack of security				
				Operational integration	Lack of service provider curation / availability				
				Personal relationship and trust	Lack of specialist focus				
				Personal relationships with leaders	Lack of startup focus				
				Proximity	Lack of sustainable business model				
				Research and data	Lack of transparency				
				Resource sharing	Lack of trust				
				Senior leadership and advocacy	Corruption				
				Shared challenge focus	Leader burnout				
				Social sharing	Local competition				
				Specialist focus	Low number of specialist skills				
				Strong top vision	Low perception of value				
				Structured programs	Operating in silos				
				Support for local community leaders	Poor internet connectivity				
				Surrounding retail	Remoteness				
				Third space	Resource intensive support				
				Use existing assets	Role conflict				
					School engagement				
					Systemic social barriers				

Figure 6-27 Summary of innovation ecosystem contributing factors of community resilience

6.5 Conclusion

Chapter 6 applies interview data to respond to the question of how the innovation ecosystem contributes towards community resilience. An overview of the results is outlined in Section 6.2, providing a summary of the concentration of enabling and inhibiting contributions against community resilience indicators. Section 6.3 presents social network analysis and qualitative data to present specific enabling and inhibiting factors for each community resilience subdimension. The results are summarised in Section 6.4 as the chapter concludes. The thesis continues with a focus on the individual role of the innovation hub in Chapter 7. The collective results of Chapters 5, 6, and 7 will then be discussed in Chapter 8.

CHAPTER 7: RESULTS - CONTRIBUTION OF THE INNOVATION HUB TO COMMUNITY RESILIENCE

7.1 Introduction

Chapter 7 provides results for the third research question relating to RQ3: *What indicators of community resilience are influenced by an innovation hub, and what are the enabling and inhibiting contributions?* (Figure 7-1). While Chapter 6 provided results for the overall ecosystem and subdimensions of community resilience, Chapter 7 refines the focus to the specific role of the innovation hub and individual indicators of community resilience. As such, some results from Chapter 6 will be included in Chapter 7.

Section 7.2 provides a brief overview of the results specific to the innovation hub., Section 7.3 provides details of the innovation hub’s enabling and inhibiting contribution against each indicator of community resilience as communicated by interviewees. Section 7.4 aggregates the results by dimension for the innovation hub before the chapter concludes.

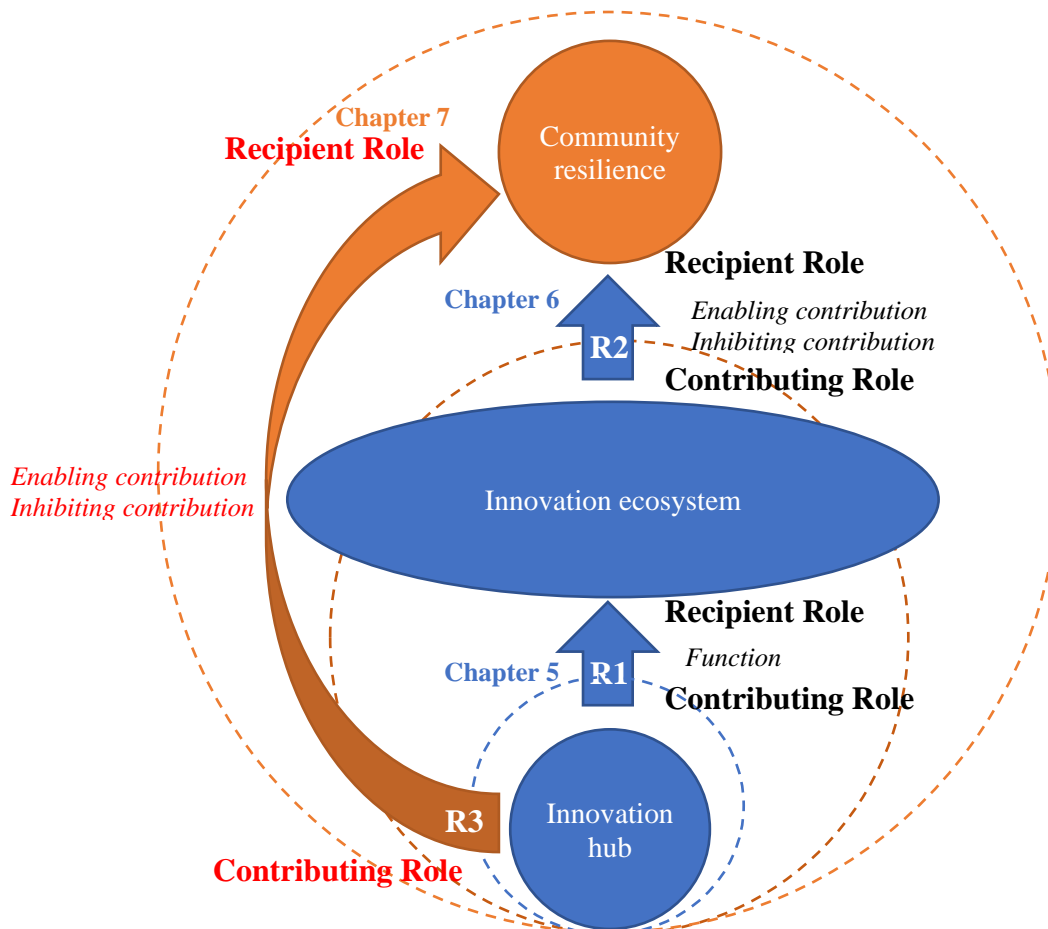


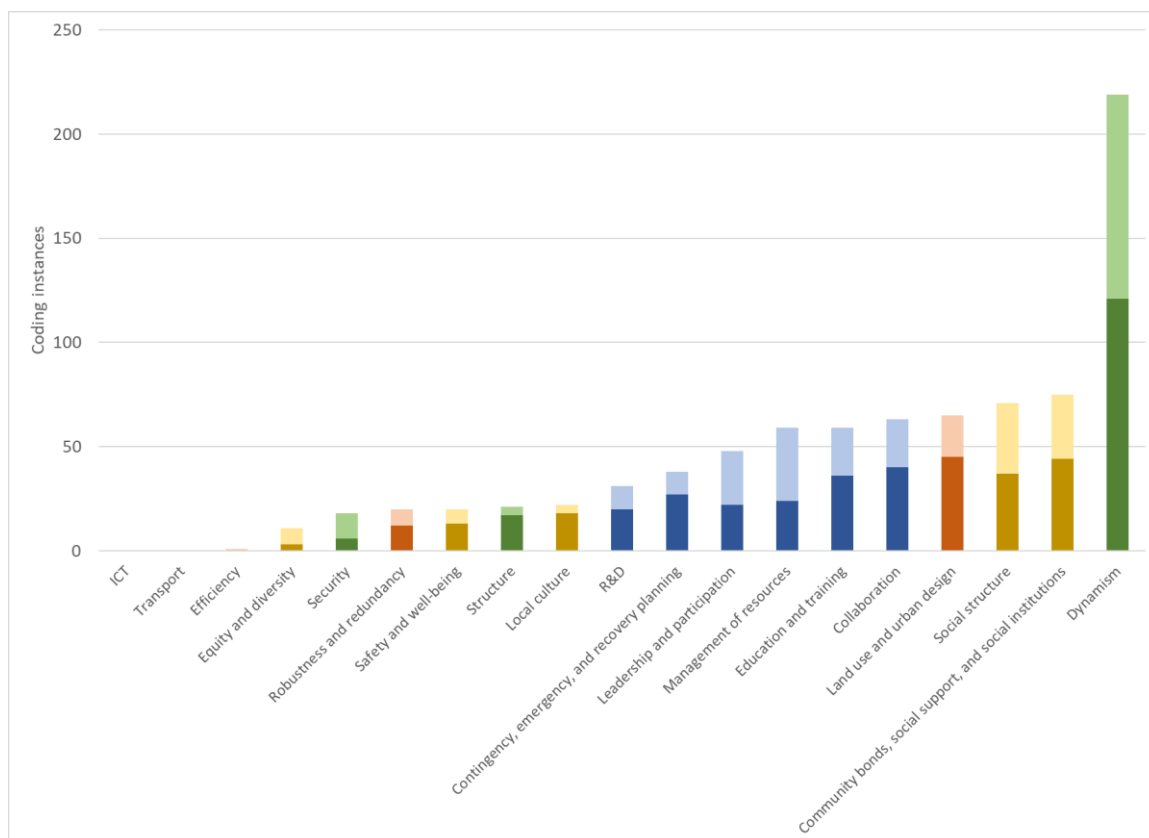
Figure 7-1 Research question address by Chapter 7 – The contributing role of the innovation hub on community resilience

7.2 Overview of the results

The contribution of the innovation hub on community resilience was assessed through the process described in Chapter 6, with an additional filter applied where the innovation hub is the contributing role in the interview content. Eight hundred and forty-one codes were attributed to the innovation hub as the contributing role to community resilience, with 35 per cent of the codes attributed to the institutional dimension, 31 per cent to the economic dimension, 24 per cent to the social and individual dimension, and 10 per cent to the built environment/infrastructure dimension. Enabling contributions ranged from a low of 56 per cent of the total instances coded for the economic dimension to a high of 66 per cent enabling contributions coded for the built environment/infrastructure dimension (Table 7-1 and Figure 7-2).

Table 7-1 Coding instances of enabling and inhibiting contribution by the innovation hub towards community resilience subdimensions

Dimension	Subdimension	Subdimension					Dimension		
		Enabling contribution	Inhibiting contribution	Total	Pct of dimension total	Pct Enabling	Total	Pct of total	Pct Enabling
Built environment / Infrastructure	ICT	0	0	0	0%	0%			
	Transport	0	0	0	0%	0%			
	Efficiency	0	1	1	1%	0%			
	Robustness and redundancy	12	8	20	23%	60%			
	Land use and urban design	45	20	65	76%	69%	86	10%	66%
Economic	Structure	17	4	21	8%	81%			
	Security	6	12	18	7%	33%			
	Dynamism	121	98	219	85%	55%	258	31%	56%
Institutional	R&D	20	11	31	10%	65%			
	Contingency, emergency, and recovery planning	27	11	38	13%	71%			
	Management of resources	24	35	59	20%	41%			
	Leadership and participation	22	26	48	16%	46%			
	Education and training	36	23	59	20%	61%			
	Collaboration	40	23	63	21%	63%	298	35%	57%
Social and individual	Equity and diversity	3	8	11	6%	27%			
	Safety and well-being	13	7	20	10%	65%			
	Local culture	18	4	22	11%	82%			
	Social structure	37	34	71	36%	52%			
	Community bonds, social support, and social institutions	44	31	75	38%	59%	199	24%	58%



LEGEND	Contributions	
	Enabling	Inhibiting
Built environment / Infrastructure subdimensions		
Economic subdimensions		
Institutional subdimensions		
Social and individual subdimensions		

Figure 7-2 Coding instances of enabling and inhibiting contribution by the innovation hub on community resilience subdimension

7.3 Social network analysis of the innovation hub contribution to community resilience indicators

Chapter 6 mapped the innovation ecosystem’s contribution to the subdimensions of community resilience using social network graphs. This section provides further detail by graphing the contribution of the innovation hub to community resilience indicators. As outlined in Chapter 3 and depicted in Figure 3-3, the data was coded based on the Interviewee role describing a Contributor role acting on a Recipient role. The nodes in the social network graphs are represented by roles in the innovation ecosystem and indicators of community resilience. The edges or network paths are based on interview descriptions of one role or actor acting on

another role or actor in a manner that relates to a community resilience indicator. Edges are colour-coded based on the description of an enabling or inhibiting relationship.

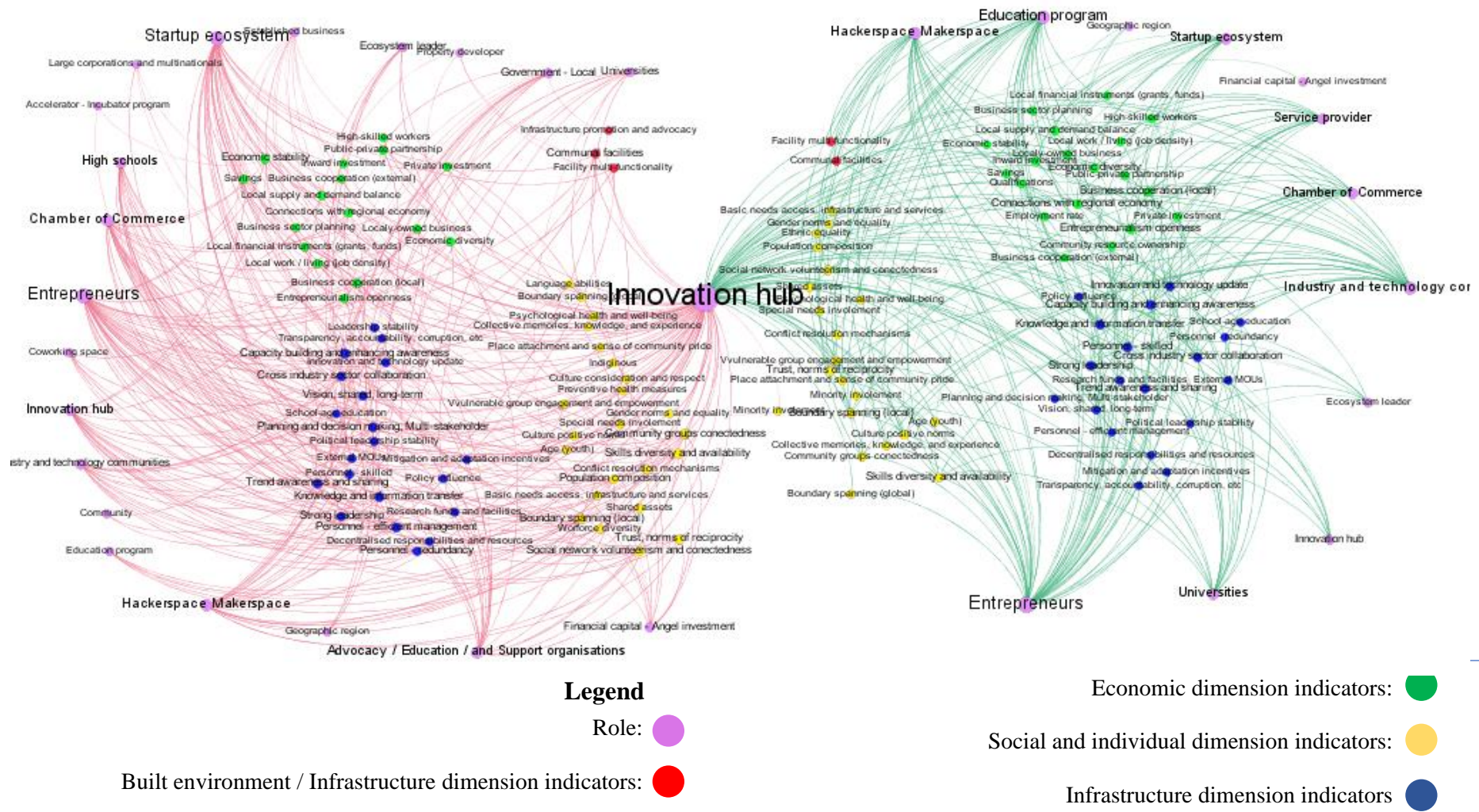


Figure 7-3 Social network graph of the contribution of the innovation hub to indicators of community resilience

7.3.1 Built environment / infrastructure

The enabling and inhibiting factors identified in Chapter 6 that are associated with the contribution of the innovation ecosystem to the built environment/infrastructure dimension of community resilience are summarised in Table 7-2. The contributions from the role of the innovation hub are highlighted for each factor. Figure 7-4 provides a social network graph of the relationship between the innovation hub and other roles of the innovation ecosystem specific to the indicators of the built environment/infrastructure dimension. The concentration of enabling and inhibiting factors and exemplar quotes are provided in Figure 7-5.

Table 7-2 Summary of the innovation ecosystem's contribution to the built environment/infrastructure dimension of community resilience

Enabling contribution factor to community resilience	Innovation hub contribution		Inhibiting contribution factor to community resilience	Innovation hub contribution
Accessible	Yes		Competing interests	Yes
Advocacy	No		Constraints from space owners	Yes
Available resources	Yes		Advocacy effort	Yes
Consistency	Yes		High speed internet costs	No
Diversity of spaces	Yes		Lack of diversity	Yes
Flexibility	Yes		Lack of local advocacy	Yes
Influence	Yes		Lack of local government role	No
Proximity	Yes		Lack of permanency	Yes
Research and data	No		Lack of resources	Yes
Surrounding retail	No		Lack of security	Yes
Third space	Yes		Operating in silos	Yes
Use existing assets	Yes		Poor internet connectivity	No

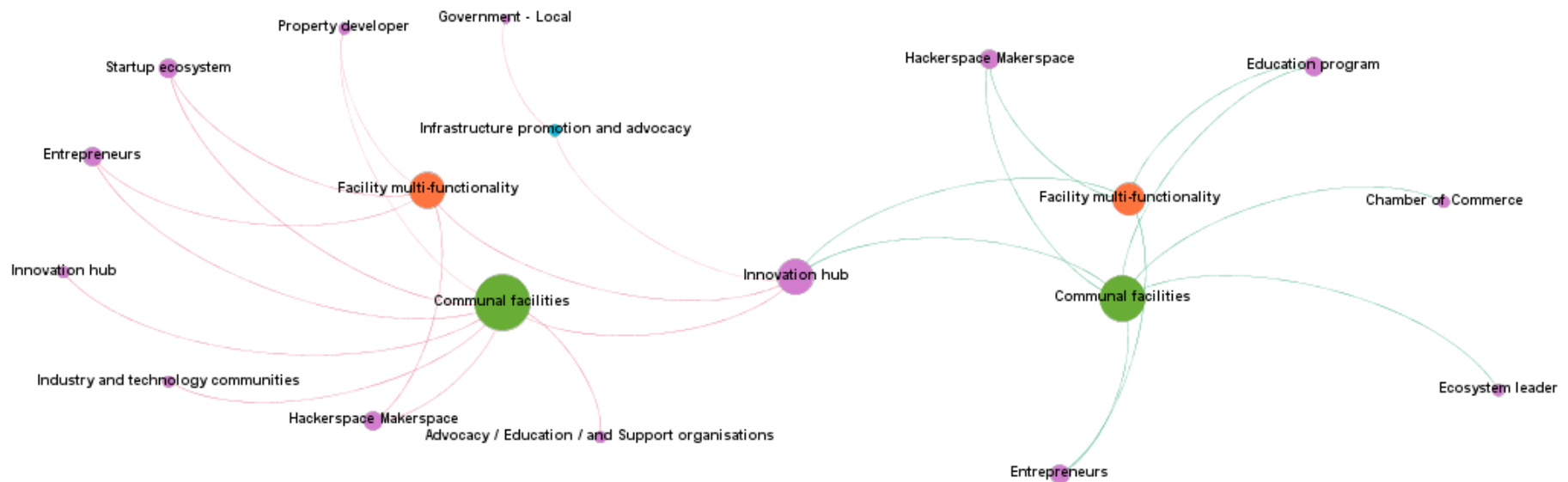
The innovation hub was described as providing an enabling contribution as a communal facility, acting as a 'third space' for the community to engage in innovation and entrepreneurial activities. The space brought roles together through programs and other hub operational activity, described as a '*centre of gravity*' and '*focal point*' around entrepreneurial and innovation activity. The hub allowed entrepreneurs to '*get out of home*' and provided a location to benefit from other enabling support, such as education, collaboration, leadership development, connections with investment and other activity.

Interviewees also described inhibiting factors of the innovation hub as a communal facility. Some respondents acting on behalf of roles of other physical spaces viewed the innovation hub as competition. Innovation hubs introduced to the region were both welcomed by other roles for adding to the diversity and entrepreneur support capacity in the region, as well as negatively impacting on existing hubs or other coworking spaces already struggling to be financially sustainable. New innovation hubs offering a communal space were described as displacing

other roles, such as entrepreneur advocacy groups, that provided entrepreneur support services without offering physical space. Local governments actively introduced innovation hubs either through developing their own innovation hub or sponsoring innovation hub brands from outside the region to establish a local space, with one local government reflecting on a lack of competition as contributing towards low quality of existing innovation hub outcomes. Entrepreneurs looked for different options for local hubs, and the style of the innovation hub mattered. Artefacts, such as pool tables and whiteboard, were noted as beneficial while other entrepreneurs desired a greater emphasis on creativity and design in the physical space.

Innovation hubs also enabled facility multi-functionality. Universities, local governments, and education providers (e.g., TAFE's) repurposed existing physical assets into innovation hubs that retained aspects of their original purpose of classrooms or council offices. Innovation hubs acted as a venue for non-related events and meetings. These events introduced various roles and community members to innovation and entrepreneurial concepts and activity inside the hub. The contribution of the innovation hub to facility multi-functionality was also described as inhibiting due to restrictions of types of businesses supported or physical amenities that were placed by the owning organisation (local government, university).

Infrastructure promotion and advocacy had little attribution to the innovation hub, apart from as an inhibitor mentioned by a peak body commenting on the political risk of a local government promoting the innovation hub. The innovation hub represented change. There was a concern over community backlash if the innovation hub was promoted at the expense of other initiatives favoured by the community and incumbent roles.



Legend

- Role: ●
 Land use and urban design subdimension: ●
- Robustness and redundancy subdimension: ●
 Efficiency subdimension: ●

Figure 7-4 Social network graph of the contribution of the innovation hub to the Built environment / Infrastructure dimension of community resilience

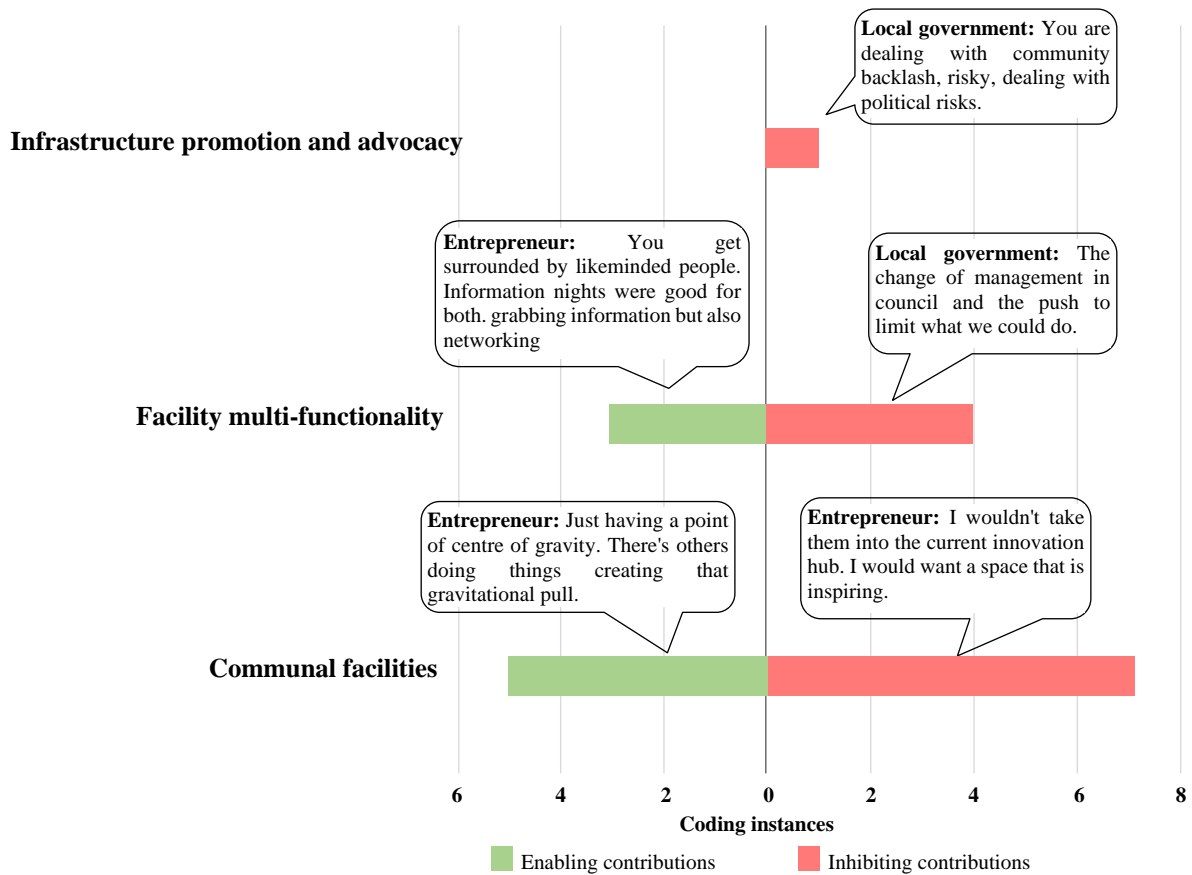


Figure 7-5 Enabling and inhibiting contributions of the innovation hub to the infrastructure subdimension of community resilience, with exemplar quotes

7.3.2 Institutional

The innovation hub had an enabling and inhibiting contribution to the five subdimensions of the Institutional dimension. These subdimensions include Collaboration; Contingency, emergency, and recovery planning; Education and training; R&D; Management of resources subdimension; and Leadership and participation. The enabling and inhibiting factors defined in Chapter 6 associated with the contribution of the innovation ecosystem to the Institutional dimension of community resilience are summarised in Table 7-3. The contributions from the role of the innovation hub are highlighted for each factor. Figure 7-6 provides a social network graph of the relationship between the innovation hub and other roles of the innovation ecosystem specific to the indicators of the Institutional dimension.

Table 7-3 Summary of the innovation ecosystem's contribution towards the Institutional dimension of community resilience

Enabling contribution factor to community resilience	Innovation hub contribution	Inhibiting contribution factor to community resilience	Innovation hub contribution
Advocacy	Yes	Australian independent culture	No
Award programs	Yes	Competing interests	Yes
Clear accountabilities and responsibilities	Yes	Corruption	Yes
Collaborative agreements	Yes	Dependant on the individual	Yes
Collaborative leadership	Yes	Disruption to young people	Yes
Collaborative programs	Yes	Emerging roles	Yes
Dedicated leaders	Yes	Fear of political risk	Yes
Distributed capability	Yes	Fragmented approach	Yes
Distributed funding	No	Funding centralisation	No
Events	Yes	IP constraints	No
Focus on fewer, higher quality initiatives	Yes	Lack of capability	Yes
Hackathons	Yes	Lack of communication	Yes
Local leader community focus	Yes	Lack of data	Yes
Media and promotion	Yes	Lack of funding	Yes
Mentoring	Yes	Lack of governance	Yes
Momentum	Yes	Lack of leadership and direction	Yes
Multiple points of leadership	Yes	Lack of legitimacy	Yes
New projects	Yes	Lack of priority	Yes
Operational integration	Yes	Lack of program follow-through	Yes
Resource sharing	Yes	Lack of research	No
Senior leadership and advocacy	No	Lack of transparency	Yes
Social sharing	Yes	Lack of trust	Yes
Strong top vision	No	Leader burnout	Yes
Structured programs	Yes	Low number of specialist skills	Yes
Support for local community leaders	No	Low perception of value	Yes
Third space	Yes	Operating in silos	Yes
		School engagement	Yes

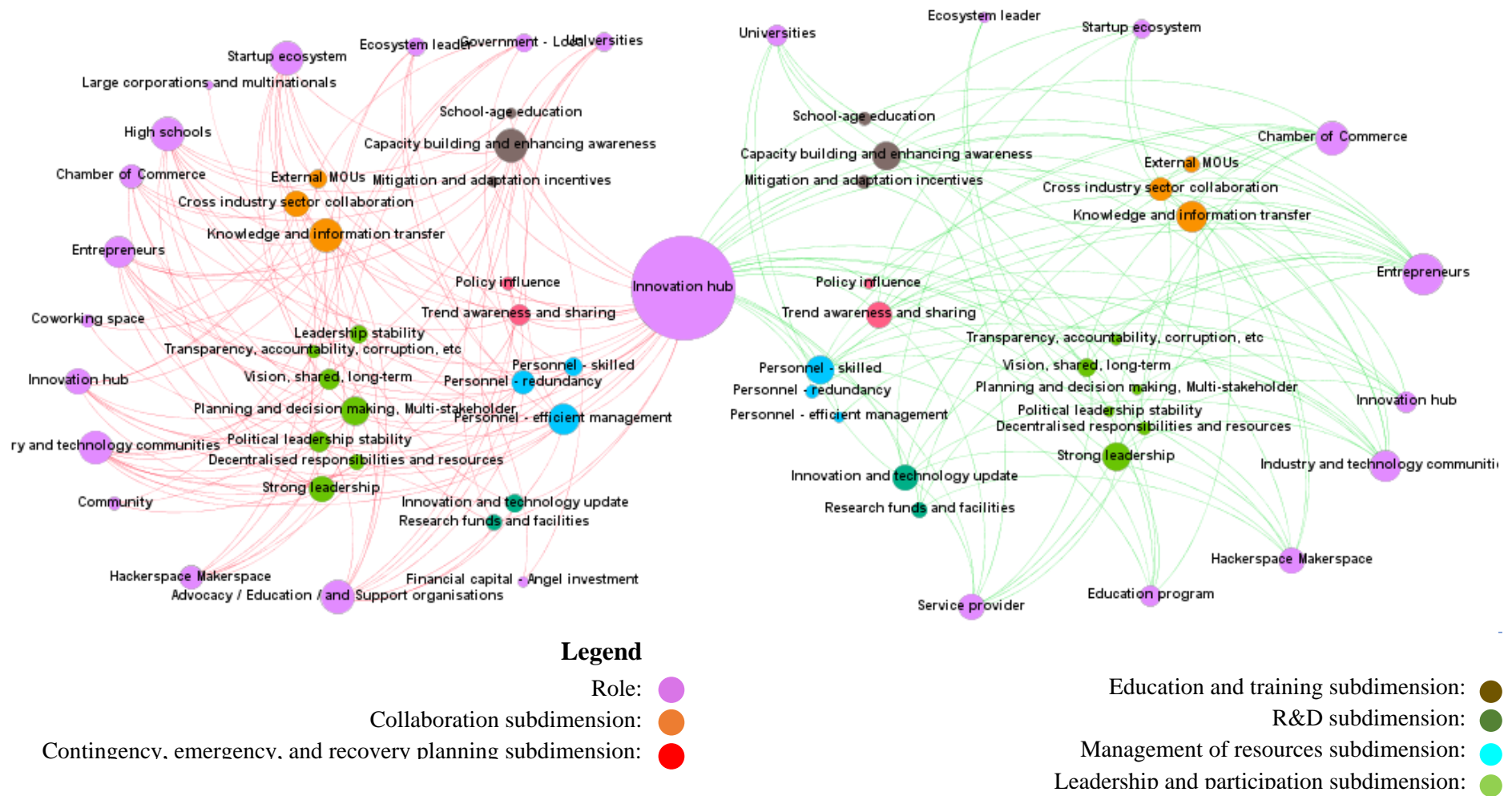


Figure 7-6 Social network graph of the contribution of the innovation hub to the Institutional dimension of community resilience

The innovation hub facilitated cross-industry sector collaboration through dedicated programs and events that attracted diverse industries, professions, and regions (Figure 7-7). Momentum was generated as activity created interest, which then resulted in generating more activity in a positive reinforcing cycle. This momentum increased further when the innovation hub focused on a specific challenge or a specific industry sector or community segment challenge. A focus on different challenges over time brought in different communities, supply chains, and stakeholder groups.

Cross-industry sector collaboration was inhibited by the innovation hub when the efforts of the hub were not seen as valued by other roles, reducing participation. Other factors include competing interests, such as a lack of engagement by a local chamber of commerce which did not see value in promoting activities to their member base or a lack of engagement by a university or government that owned a competing innovation hub. The reasons behind a lack of collaboration was not expressed as malicious, but more a lack of perceived value combined with roles focusing limited resources on their own internal initiatives. Collaboration required additional effort by all roles, including innovation hubs. Scarce resources, lack of funding to support collaboration activities, and leader burnout all contributed to inhibiting cross-sector collaboration.

External memorandum of understandings (MOUs) included semi-formal and formal agreements between different actors and often between different roles. Innovation hubs enabled external MOUs through delivery of services, such as programs on behalf of universities or government, and large corporation and established business sponsorships of innovation hub programs and operations. Service providers, leaders, and mentors established informal agreements with innovation hubs trading access to hub members and use of the venue in exchange for mentoring by the service provider or local business leader. Interviews identified situations where external MOUs were inhibited as a result of discrepancies in culture, governance, vision, objectives, and process between roles. Examples shared include differences in objectives between the innovation hub and economic development bodies, different approaches to governance between innovation hubs and large corporates, and varying process requirements with government in areas such as procurement or member on-boarding.

The innovation hub enabled knowledge and information transfer through programs and events, as well as providing a space for unplanned connections. Interviewees described learning skills for business planning, investment, technical software and hardware development, personal

development, and business operations, such as legal and accounting. Perception and lack of community education played a role in inhibiting knowledge and information transfer, as the community and other roles did not engage in the innovation hub based on perceptions that it was for people that were already ‘*techy*’ or fit a certain age, gender, or socio-economic demographic. Knowledge and information transfer could also be inhibited in geographically remote or distributed regions when there was a requirement to physically access innovation hub services at a common location.

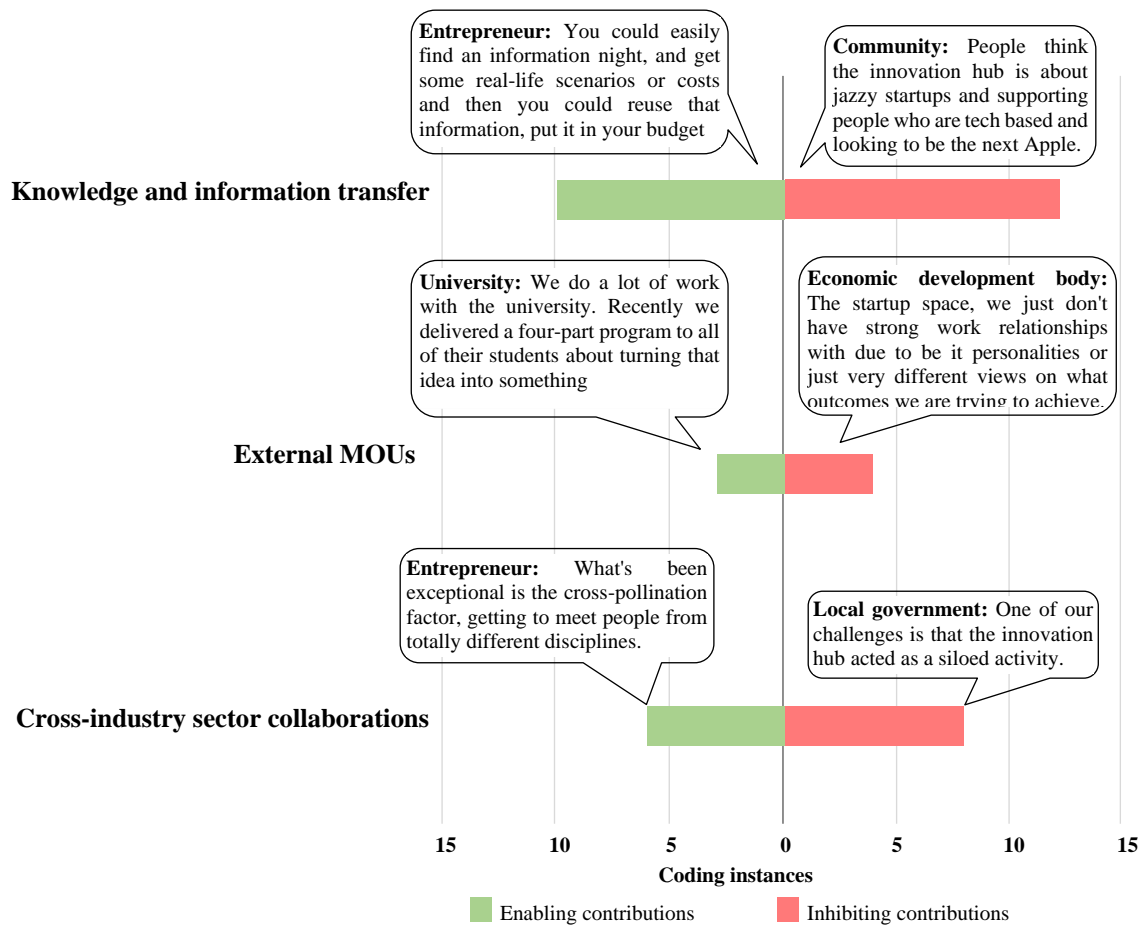


Figure 7-7 Enabling and inhibiting contributions of the innovation hub to the Institutional Collaboration subdimension indicators of community resilience

The innovation hub was identified as having an enabling contribution towards policy influence as a means to deliver and validate policy related to innovation and entrepreneurship. Government-sponsored activities such as events, hackathons, accelerators, and award programs delivered on policy agendas. Programs where the local government was not involved, such as in other regions or supported by private industry, attracted government interest and influenced government action (Figure 7-8). The experience with the entrepreneur, either positive or negative, could then have an influence on future government policy and direction. If there was

a poor perception of outcomes or a lack of engagement with government by the innovation hub, there was also an inhibiting contribution that created a lack of policy influence. T

The innovation hub focused on emerging trends and technologies, promoted outcomes of member entrepreneurs and innovating businesses, and focused entrepreneurial activity on shared challenges and opportunities. These activities enabled trend awareness and sharing, bringing new ideas into the local community and sharing between roles. A lack of awareness or perception of low value of the innovation hub by other roles inhibited the contribution of the innovation hub on the indicator of trend awareness and sharing. Other roles had difficulty in communicating the value of the hub and attributed perceived failures of previous incubators, such as business enterprise centres to the activity of the innovation hub.

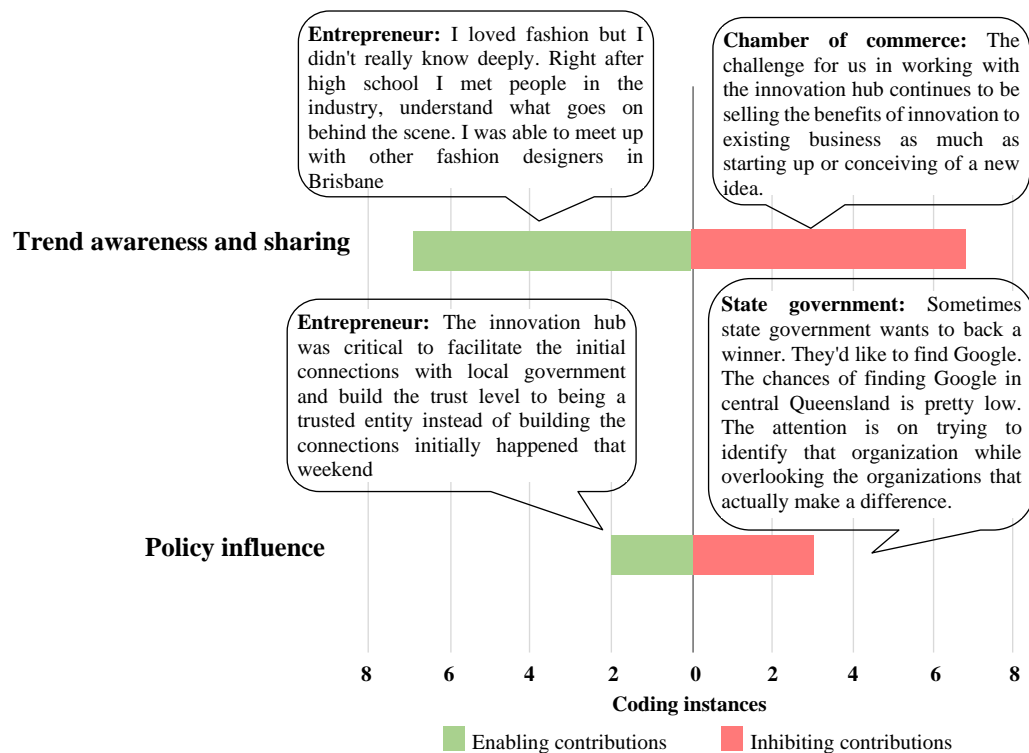


Figure 7-8 Enabling and inhibiting contributions of the innovation hub to the Institutional Contingency, emergency, and recovery planning subdimension indicators of community resilience

The innovation hub enabled education and training through the provision of mentoring, events, leadership, and programs both in the innovation hub and in the community (Figure 7-9). Other roles saw the innovation hub as a resource for specialist education, such as a chamber of commerce supporting their members in startup activity, an education program in prisons viewing the innovation hub acting as transition support, or a youth entrepreneur who received support from a program delivered by the innovation hub into high schools.

Education and training could also be inhibited by the innovation hub. Engagement into high schools was communicated as a challenge both by individual high schools, as well as by the innovation hub to support school-age education. Innovation hubs could lack the resources, networks, and capabilities to consistently support school-age education beyond one-off programs or workshops.

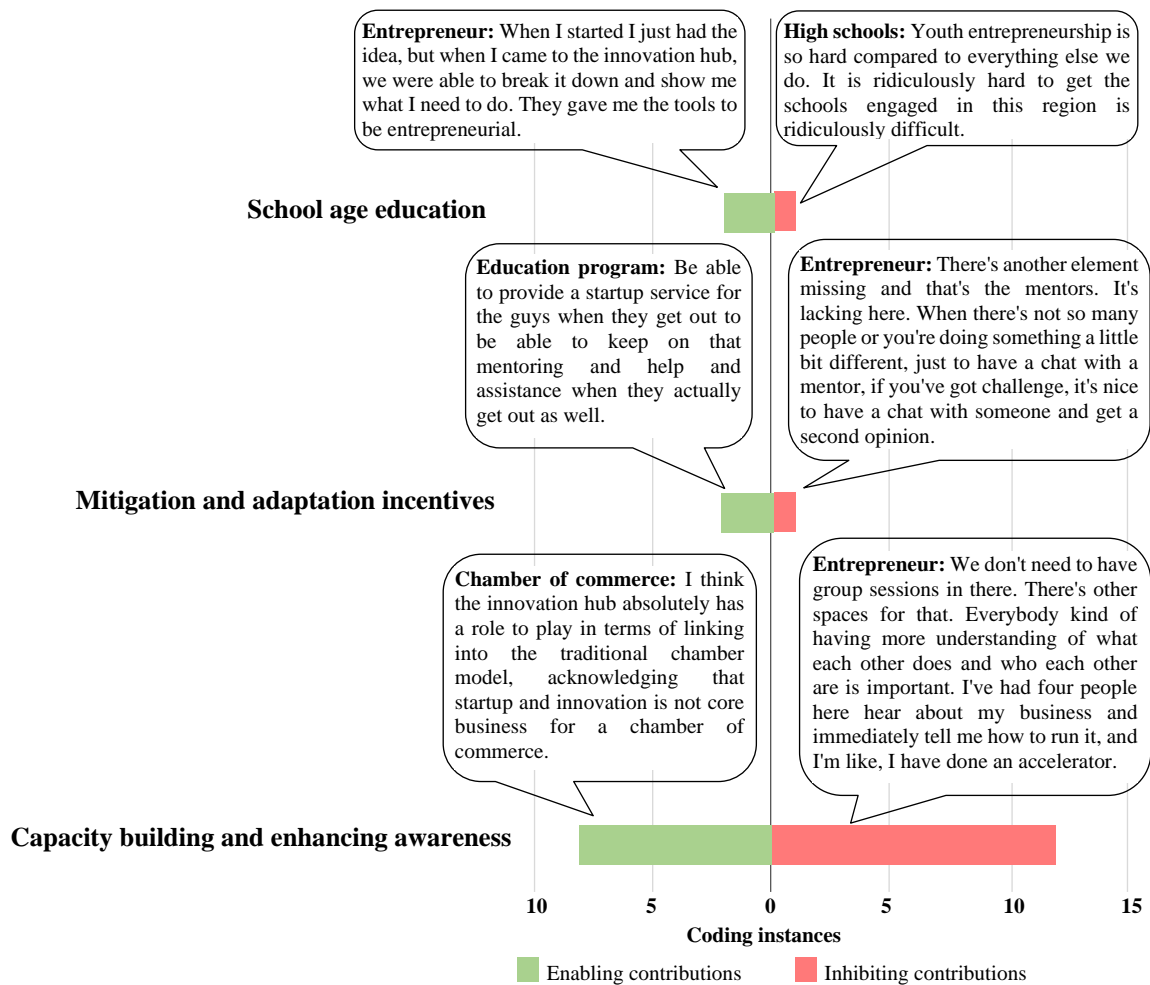


Figure 7-9 Enabling and inhibiting contributions of the innovation hub to the Institutional Education and training subdimension indicators of community resilience

The innovation hub both enabled and inhibited community resilience indicators of the leadership and participation subdimension of community resilience (Figure 7-10). Innovation hubs contributed to the shared long-term vision of a region, often involving multiple diverse stakeholders to develop programs, support entrepreneur members, and collaboration on cross-role initiatives. Local service providers shared their excitement about innovation hub-led initiatives, and local governments supported initiatives driven by the innovation hub designed

for long-term impact on the local community. Innovation hubs provided strong leadership distinct from other leadership roles in the ecosystem that focused on entrepreneurs who were often an under-represented segment of the community.

Innovation hubs facilitated decentralised responsibilities and resources, expanding services to regional areas and supporting external delivery of economic development services by local governments or research commercialisation functions of universities. Transparency in leadership was enabled through clarity in accountabilities and culture lines between innovation hubs and roles that sponsored the hubs, such as local government or universities. Innovation hubs also inhibited leadership and participation, acting as a siloed activity to other roles and even initiatives within the same local government to impact on the long-term shared vision. Changes in support for the innovation hub by ownership roles of government or universities inhibited leadership stability and strength.

While innovation facilitated decentralised leadership, it also acted to inhibit decentralised leadership when the innovation hub was owned by a significant role in the region, such as local government or university. The introduction of an innovation hub owned by a local government could displace community-led initiatives, centralising innovation activity away from the community. The operations of the hub could be seen as taking on the bureaucratic culture and processes of the role of government or university that owned the hub, or conversely having no alignment between the strategy and vision of the owning role and the innovation hub. In the absence of an owning role of government or university, an innovation hub owned by an independent individual could lack the support that enabled consistency and stability of leadership. The result could be a lack of reliability in the community.

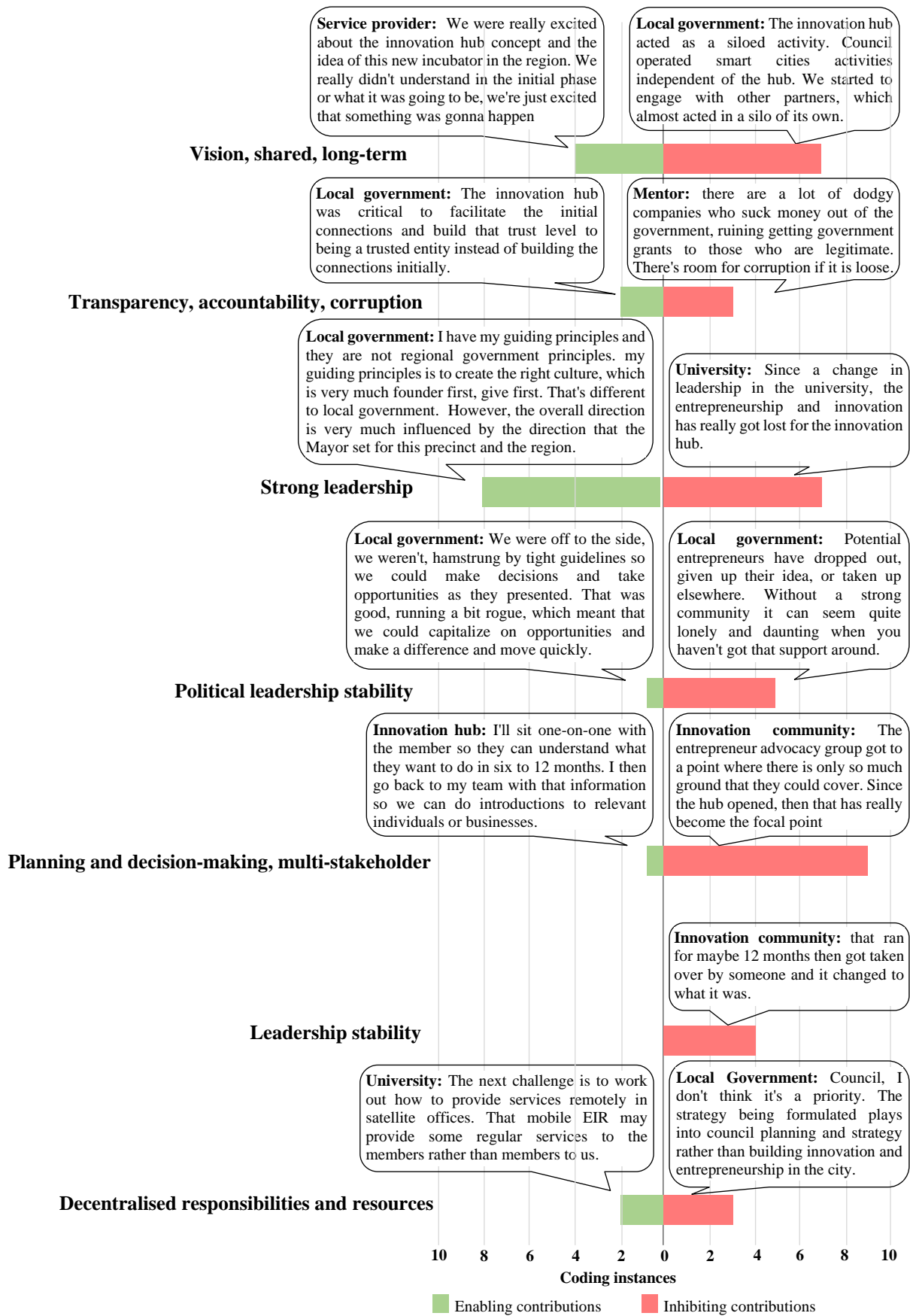


Figure 7-10 Enabling and inhibiting contributions of the innovation hub to the Institutional Leadership and participation subdimension indicators of community resilience

Three indicators for the Management of resources subdimension of community resilience relate to the skill, redundancy, and efficient management of personnel. The innovation hub provided both an enabling and inhibiting contribution towards skilled personnel and a predominantly inhibiting contribution to personnel redundancy and efficient management (Figure 7-11). The distinction made in the research for skilled personnel as compared to education and training is the contribution to skilling resources for the management of ecosystem services as compared to training and education in general.

The innovation hub enabled the skilling of ecosystem support services in local regions as participants in events and programs delivered by the innovation hub brought those skills back and applied them to their own regions and other roles. Leaders in high schools and universities attended hackathons in innovation hubs in metro areas and then developed youth-focused hackathons in their regions. Ecosystem leaders in the hubs learned on the job as they developed and delivered programs, supported by local governments and universities. Much of the description of enabling management skills was self-development and ad hoc, lacking intentional development. Skills in innovation hubs focused on easy-to-acquire skills, and there was a lack of hands-on experience in more advanced innovation and entrepreneurial activity.

Respondents from all innovation hubs shared inhibiting factors of lack of resources and leader burnout. Efficient management of personnel was enabled when there was additional resource support from the role that owned the hub, such as government, university, or head office of a multi-site innovation hub model. Local government innovation hubs required additional resources dedicated to governance and reporting. The owning role provided additional support through centralised shared services for administrative, procurement, IT, and human resources support. For multi-site locations, the use of external programs or programs developed by a head office meant that local providers did not need to develop their own programs and could focus on program delivery.

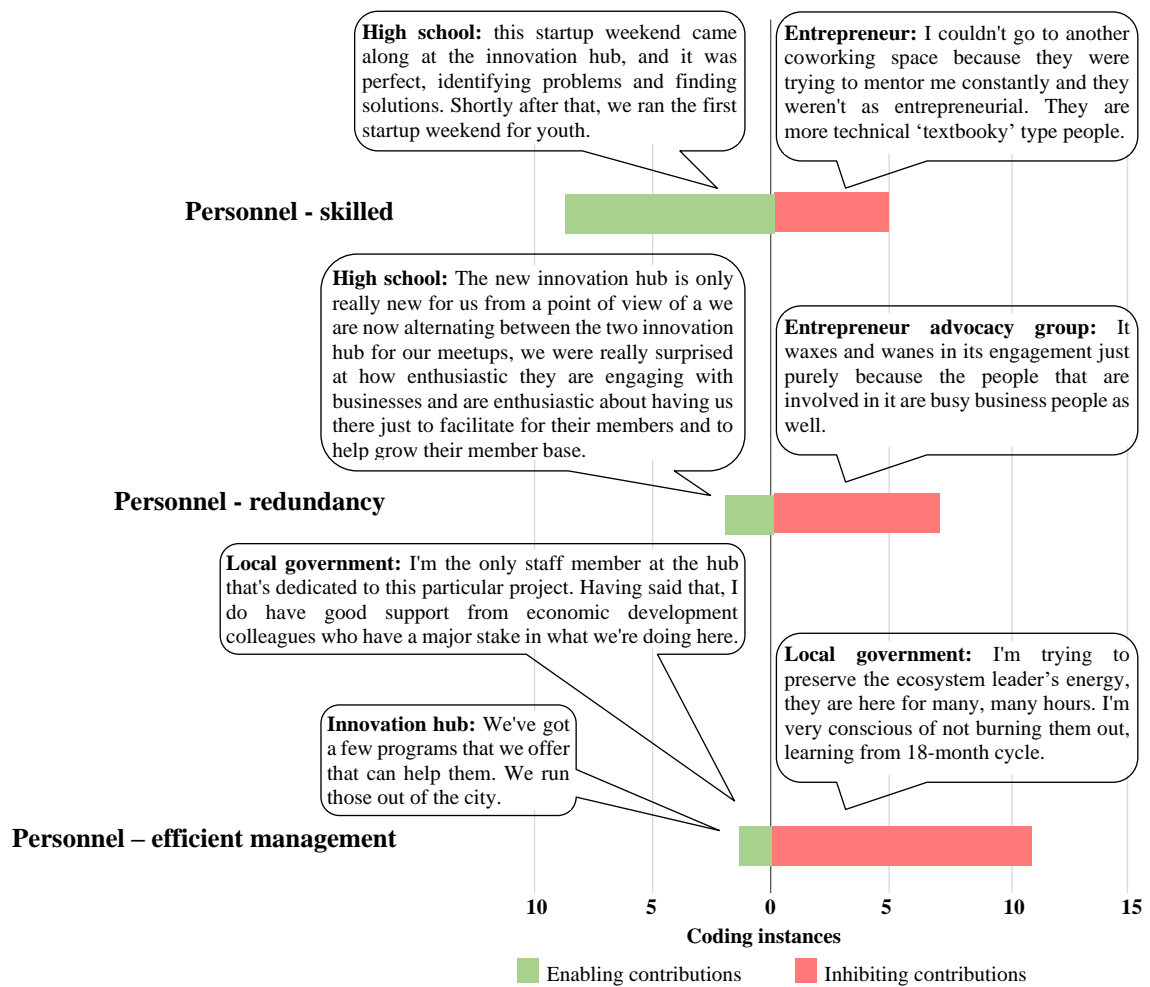


Figure 7-11 Enabling and inhibiting contributions of the innovation hub to the Institutional Management of resources subdimension indicators of community resilience

For the Institutional subdimension of R&D, or research and development, the innovation hub again had both an enabling and inhibiting contribution (Figure 7-12). Comments associated with the indicator of research funds and facilities identified innovation hubs as using technology as a means of activation for the physical space. This could be supported by universities or technology providers who funded technology areas in the physical hub, such as virtual reality stations. These activation points attracted the community who became aware of the technology. The awareness was amplified through promotion of the technology engagement opportunities through roles that owned the innovation hub such, as local governments and universities.

Integration of research into the innovation hubs was otherwise limited, even for innovation hubs owned by universities. Comments from entrepreneurs, innovation hubs, and universities noted research lacked practical application, industry experience, and an over-emphasis on theory. The concept of connecting research activity with innovation hub activities was

understood in principle but there was little evidence shared in the interviews of practical engagement.

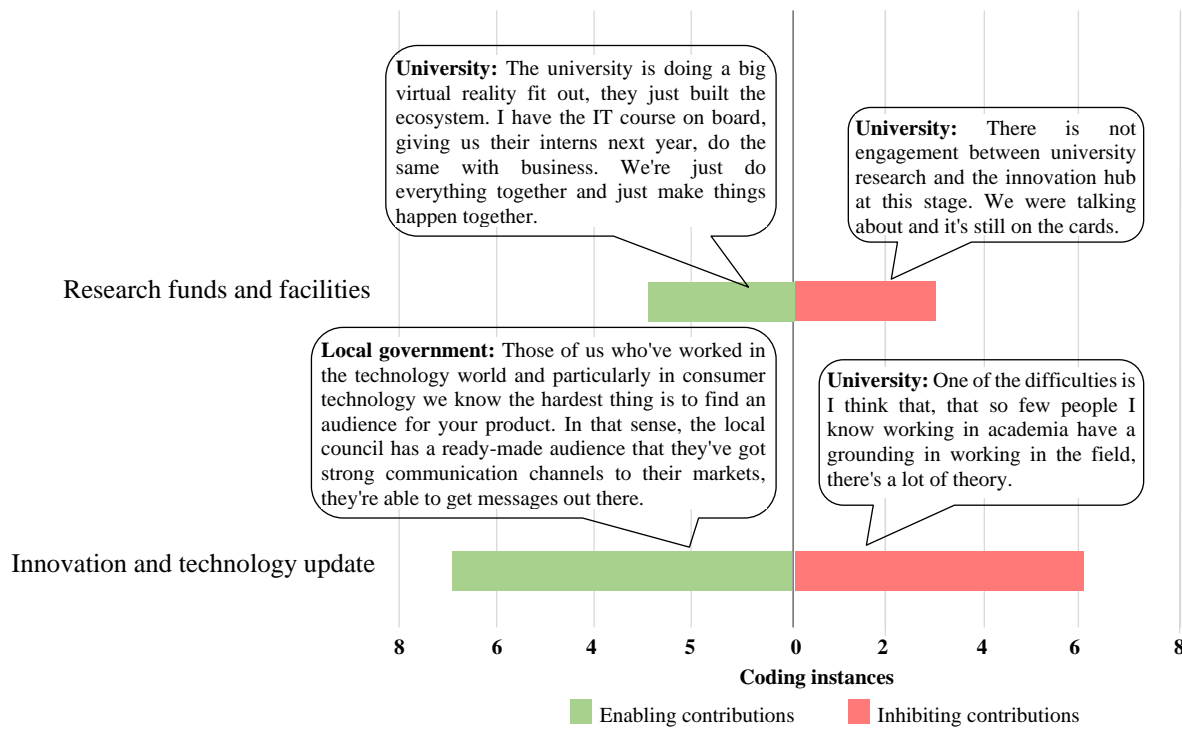


Figure 7-12 Enabling and inhibiting contributions of the innovation hub to the Institutional R&D subdimension indicators of community resilience

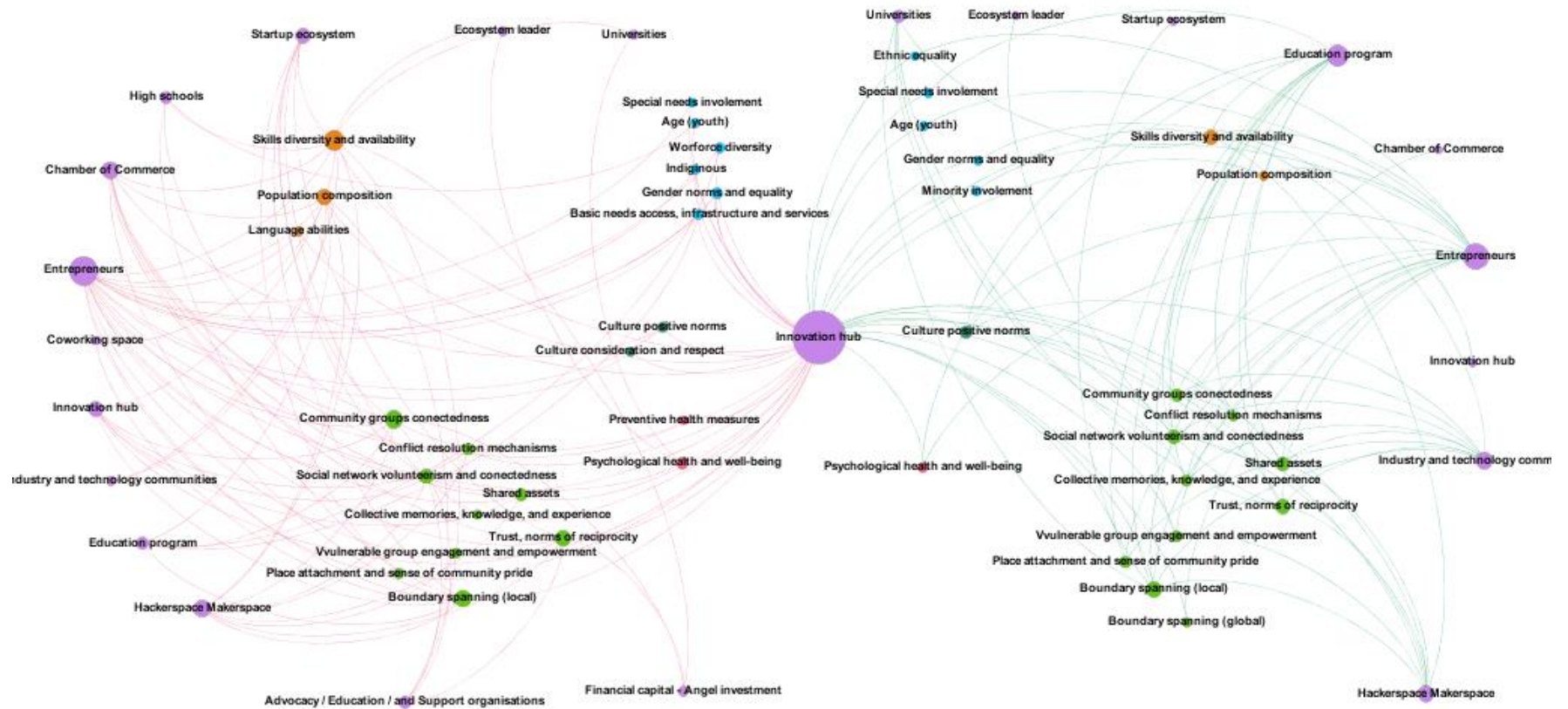
7.3.3 Social and individual

The Social and individual dimension included four subdimensions of Safety and well-being, Local culture, Community bonds, social support, and social institutions, and Equity and diversity. The enabling and inhibiting factors defined in Chapter 6 associated with the contribution of the innovation ecosystem towards the Social and individual dimension of community resilience are summarised in Table 7-4. The contributions from the role of the innovation hub are highlighted for each factor. Figure 7-13 provides a social network graph of the relationship between the innovation hub and other roles of the innovation ecosystem specific to the indicators of the Social and individual dimension.

Table 7-4 Summary of the innovation ecosystem's contribution towards the Social and individual dimension of community resilience

Enabling contribution factor to community resilience	Innovation hub contribution	Inhibiting contribution factor to community resilience	Innovation hub contribution
Boundary-spanning programs	Yes	Australian independent culture	No
Clear accountabilities and responsibilities	Yes	Attributing past failure to new models	Yes
Collaborative programs	Yes	Bureaucracy	Yes
Community in programs	Yes	Corruption	Yes
Cross-promotion	Yes	Emphasis on high growth firms	Yes
Dedicated media	Yes	Exclusive language	Yes
Dedicated third space	Yes	Focus on others at expense of self	Yes
Distributed leadership	Yes	Lack of awareness or understanding	Yes
Diverse leadership capability	Yes	Lack of capability	Yes
Focused programs	Yes	Lack of capacity in ecosystem leaders	Yes
Generational leadership	Yes	Lack of common challenge	Yes
Incumbent leadership	Yes	Lack of funding	Yes
Innovation-driven corporations	Yes	Lack of leadership and direction	Yes
Integrated programs	Yes	Lack of local collaboration	Yes
Leadership capability building	Yes	Lack of perceived value	Yes
Personal relationship and trust	Yes	Lack of redundancy	No
Personal relationships with leaders	Yes	Lack of resources	Yes
Senior leadership and advocacy	Yes	Lack of trust	Yes
Shared challenge focus	Yes	Local competition	Yes
Third space	Yes	Low perception of value	Yes
		Operating in silos	Yes
		Remoteness	No
		Resource intensive support	Yes
		Role conflict	Yes
		Systemic social barriers	Yes

The innovation hub provided enabling and inhibiting contributions to the Social and individual dimension of community resilience (Figure 7-14). The innovation hub facilitated local boundary-spanning functions through a range of functions including events and programs that brought diverse roles together including chambers of commerce, local, state, and federal levels of government, and investment capital. Roles, such as the chamber of commerce that would not previously have engaged with entrepreneurial or innovation activity leveraged the innovation hub to provide new ways of thinking and opportunities for their members.



Legend

- Role: ●
- Local culture subdimension: ●
- Social structure subdimension: ●
- Equity and diversity subdimension: ●
- Safety and well-being subdimension: ●
- Community bonds, social support, and social institutions subdimension: ●

Figure 7-13 Social network graph of the contribution of the innovation hub to the Social and individual dimension of community resilience

Examples of enabling and inhibiting contributions of the innovation hub to the Community bonds, social support, and social institutions subdimension are outlined in Figure 7-14. The innovation hub enabled local boundary-spanning functions, bringing together diverse roles through programs and events that would not otherwise have interacted. These efforts were inhibited when other roles did not recognise the value in the hub. Global boundary spanning contributions were less evident. Those that were shared were driven by the entrepreneurs based on personal background or needing access to markets as compared to being driven by the innovation hubs.

The innovation hub enabled other aspects of connection through enabling trust, creating a safe space for meetings and connections, providing opportunities for volunteers, and creating pride in the local region. There was also an inhibiting side to social connections as well. Trust could be abused, with entrepreneurs taking the ideas of others or service providers taking advantage of government grants without adding value to entrepreneurs. An entrepreneur's association with place could be lost when innovation structures changed, when key leaders left the hub, or when entrepreneurs felt they had moved past the services offered by the hub. The innovation hub was described as contributing to volunteer burnout, and a perceived lack of offering for non-technical businesses created potential disempowerment for local vulnerable groups.

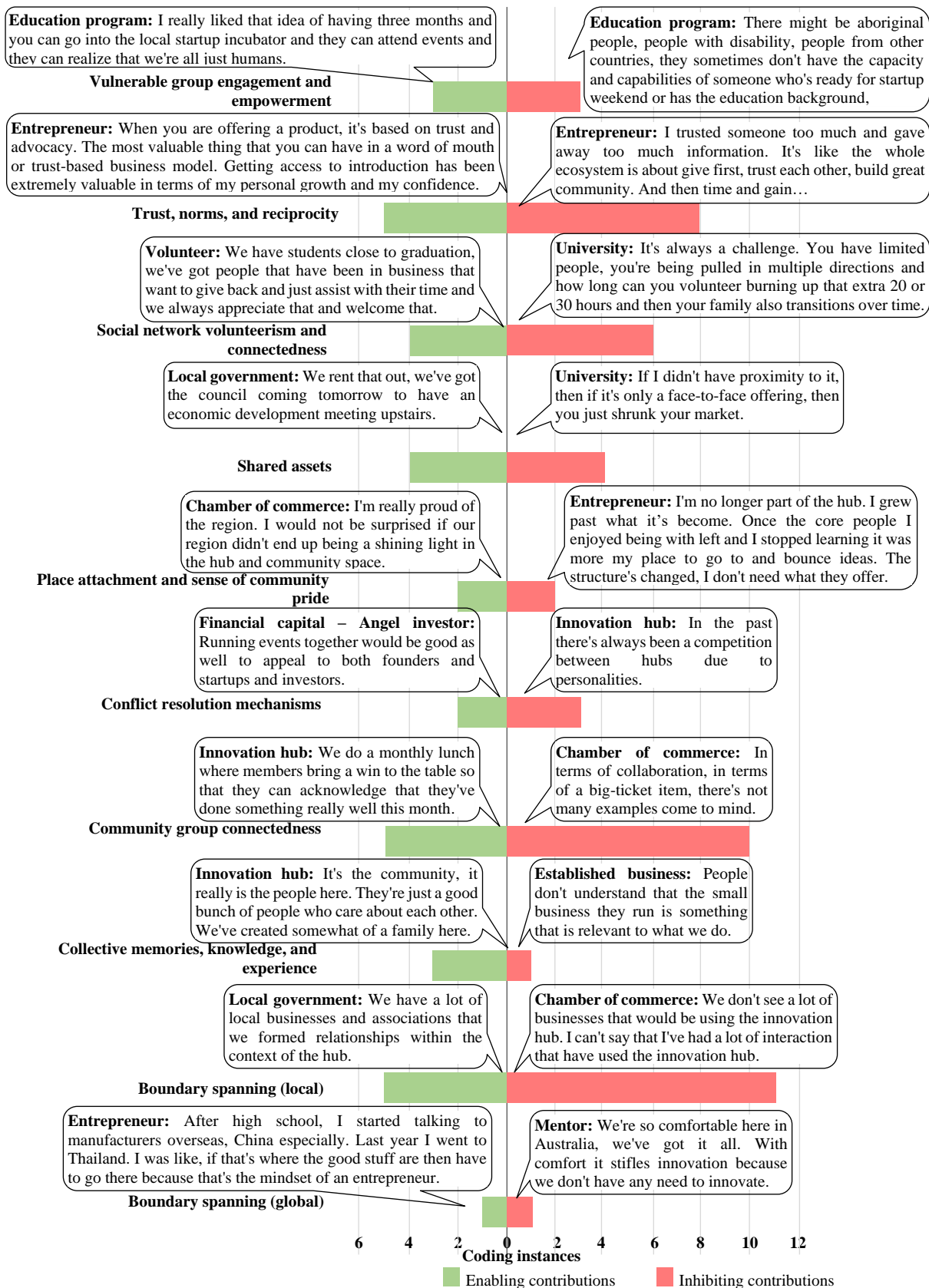


Figure 7-14 Enabling and inhibiting contributions of the innovation hub to the Social and individual Community bonds, social support, and social institutions subdimension indicators of community resilience

The innovation hub was also described as enabling and inhibiting equity and diversity for several groups of people (Figure 7-15). Apart from individual entrepreneurial projects, there was no evidence of programs focusing on older generations. Most innovation hubs were, however, described as having some engagement with youth and connections with the local high schools. Enabling contributions included the delivery of youth programs in the hub and in the high schools as well as support for bringing together collaborative education providers in the region including universities, primary and high schools, and training organisations. However, the innovation hub was described as inhibiting this progress if the programs were seen as one-off and did not embed knowledge and capability into the school. A lack of resources and funding, operating in silos, and difficulty in engaging with schools and bureaucracy were also contributing inhibiting factors to a lack of sustained or systemic delivery into high schools.

There were examples shared of support for gender norms and equality through enabling programs for female entrepreneurs. These programs were the exception to a perception of a male-dominated environment in the innovation hub. Similarly, there were specific enabling programs for minorities or disabilities, but a shared perception of elitist and exclusive hubs environments. While there are specific indigenous programs in the Australian innovation ecosystem, there was nothing evident in the Queensland sample during the time of the research. This gap in indigenous entrepreneur and innovation support was addressed through dedicated education programs but was not integrated into the local innovation hub.

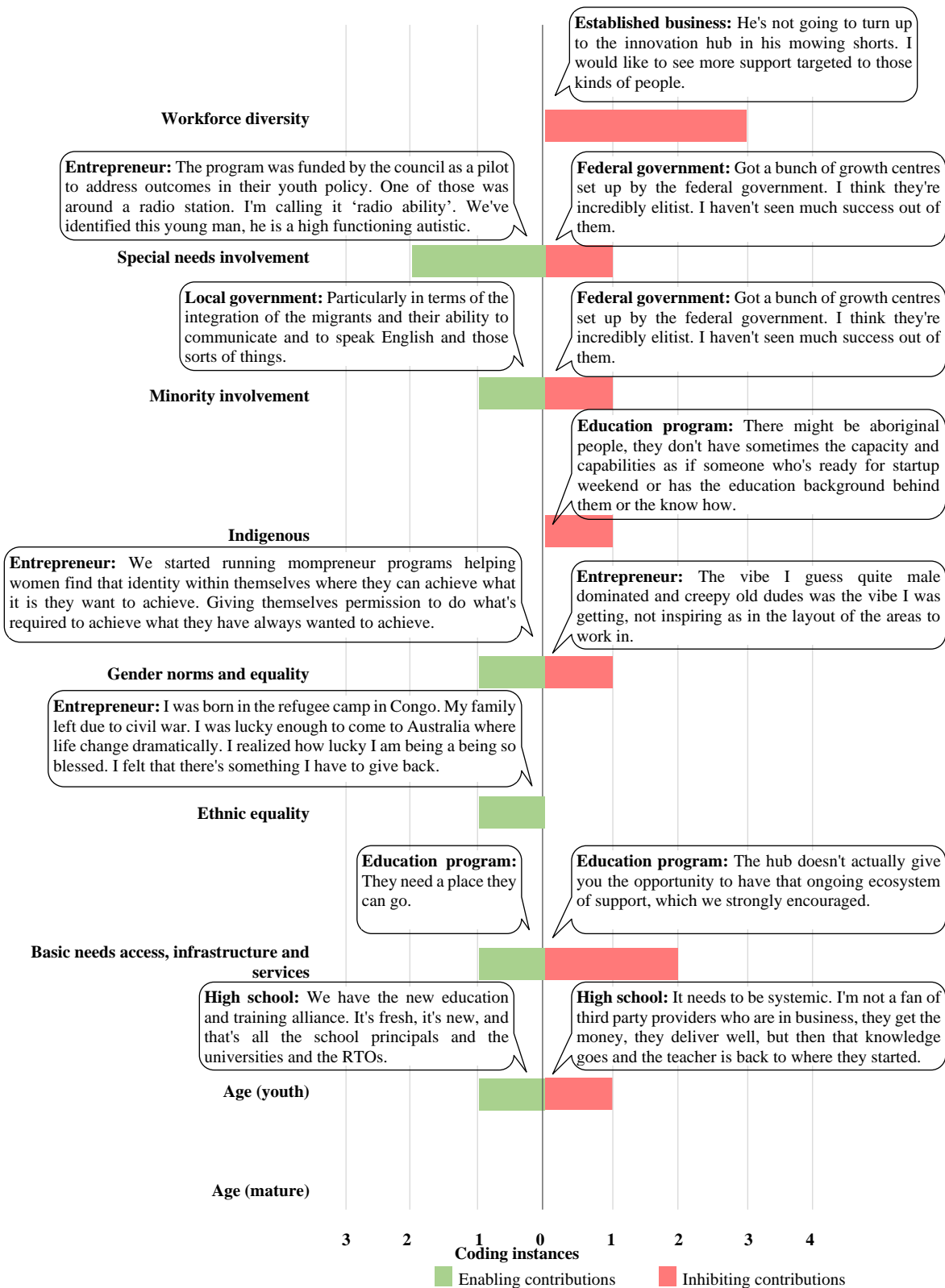


Figure 7-15 Enabling and inhibiting contributions of the innovation hub to the Social and individual Equity and diversity subdimension indicators of community resilience

Examples of the innovation hub’s contribution to the Social structure subdimension is shown in Figure 7-16. The innovation hub provided an enabling contribution to skills diversity and availability as a central place where the community could expect to find and develop talent and skills. Examples shared included entrepreneurs finding staff and accessing technical support for their business. The innovation hub enabled change to the composition of the population through supporting the transformation of individuals into entrepreneurs and attracting new people to the region.

While the innovation hub introduced diversity through new technical skills and knowledge industries, an inhibiting contribution was seen if the new group was homogenous in itself and failed to integrate with the community. The members of the innovation hub were described as developing a language of their own that “*no normal person could understand*”. There was also a need for density and diversity of members and a process of renewal of people in the hub to create value and avoid continuously engaging with the same people.

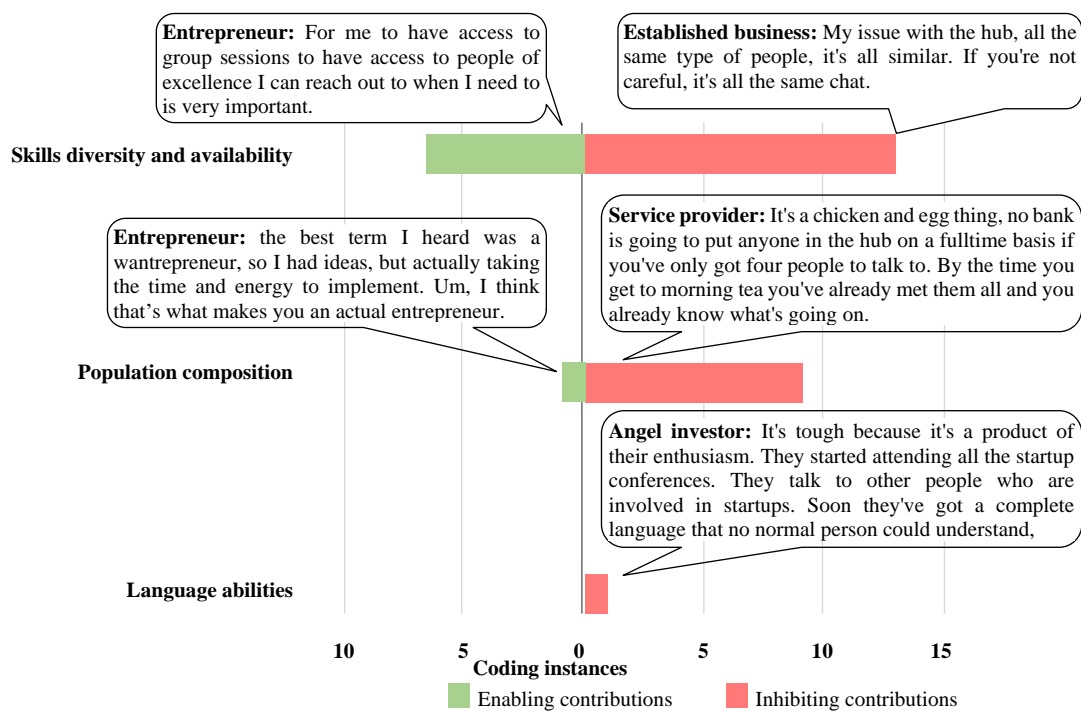


Figure 7-16 Enabling and inhibiting contributions of the innovation hub to the Social and individual Social structure subdimension indicators of community resilience

The innovation hub contributed to safety and wellbeing, as reflected in the indicators of psychological health and well-being and preventive health measures (Figure 7-17). Leaders in innovation hubs described providing counselling support for entrepreneurs, including buying gifts such as flowers and having frequent and ad hoc meetings over coffee to work through

both business and personal challenges. Other roles referenced the personal support from the community in innovation hubs, referring to the collective “tribe”, “family”, and “my people”.

Entrepreneur and innovation activities involved risk and uncertainty. Innovation hubs attracted entrepreneurs who were engaging in new businesses for the first time. Personal support in innovation hubs was provided without formal training. As one education program provider commented, individuals with mental health issues: “going into an environment that may not be as supportive can really be detrimental to that person.” Entrepreneurs described feelings of fear of failure and feeling unworthy, which could be exasperated by pressures in an innovation hub.

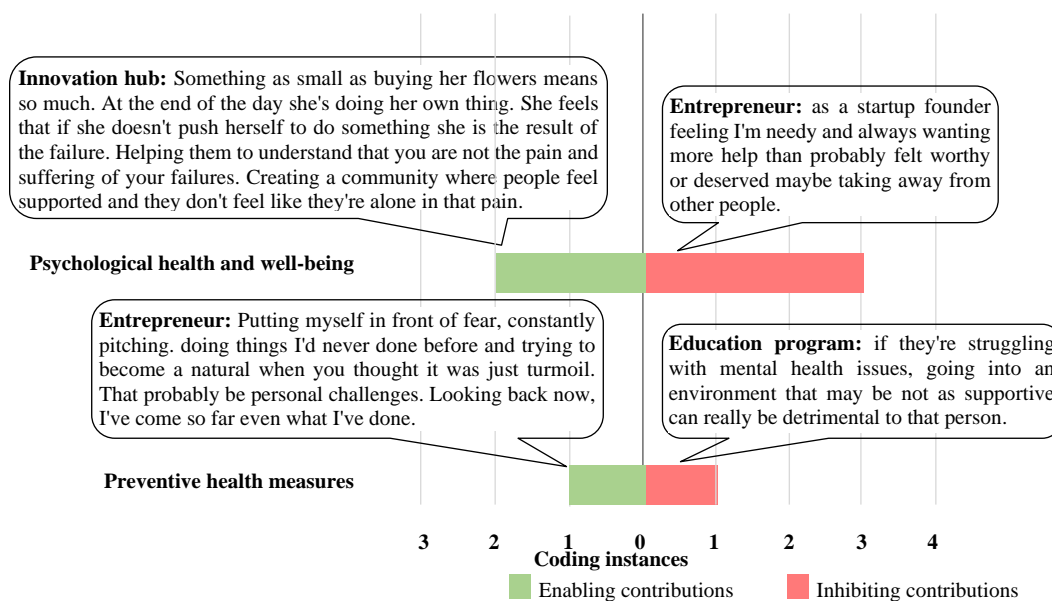


Figure 7-17 Enabling and inhibiting contributions of the innovation hub to the Social and individual Safety and well-being subdimension indicators of community resilience

The innovation hub was described as bringing its own culture, as well as interacting with existing local culture (Figure 7-18). Innovation hubs had their own culture codes, both implicit and explicit. The contribution of innovation hubs to culture was viewed as enabling for roles that aligned with and benefited from the culture in innovation hubs, described in terms of “member first”, “give first”, “founder first”, and a focus on execution and action.

The culture of the innovation hub could be at the expense of the local culture. Incumbent roles, such as a chamber of commerce, viewed the innovation hub as low quality while an innovation hub questioned how a chamber of commerce was relevant to its members. Entrepreneurs seeking to engage in new technology and creative industries may feel the need to leave the

region if the innovation hub did not satisfy their view of the “*sorts of people*” they felt they needed to be around.

The local culture subdimension indicator of ‘previous experience’ is adapted to this research to reflect ‘previous experience in startup ecosystems or founding a startup’. This indicator was not identified from the interviews. Ecosystem support is a relatively new field and many of the roles were emerging. Practical experience was learned through performing the role, with few having experience in other regions prior to taking the role. Even if there was experience from other regions, much of the value came from local connections.

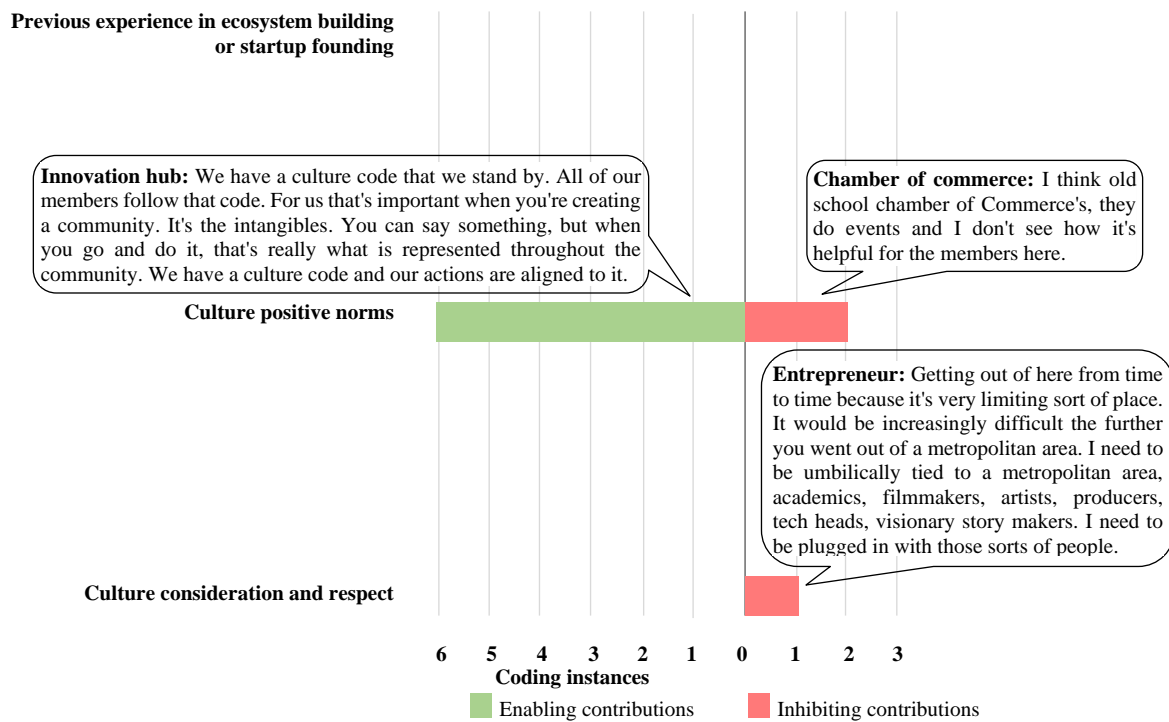


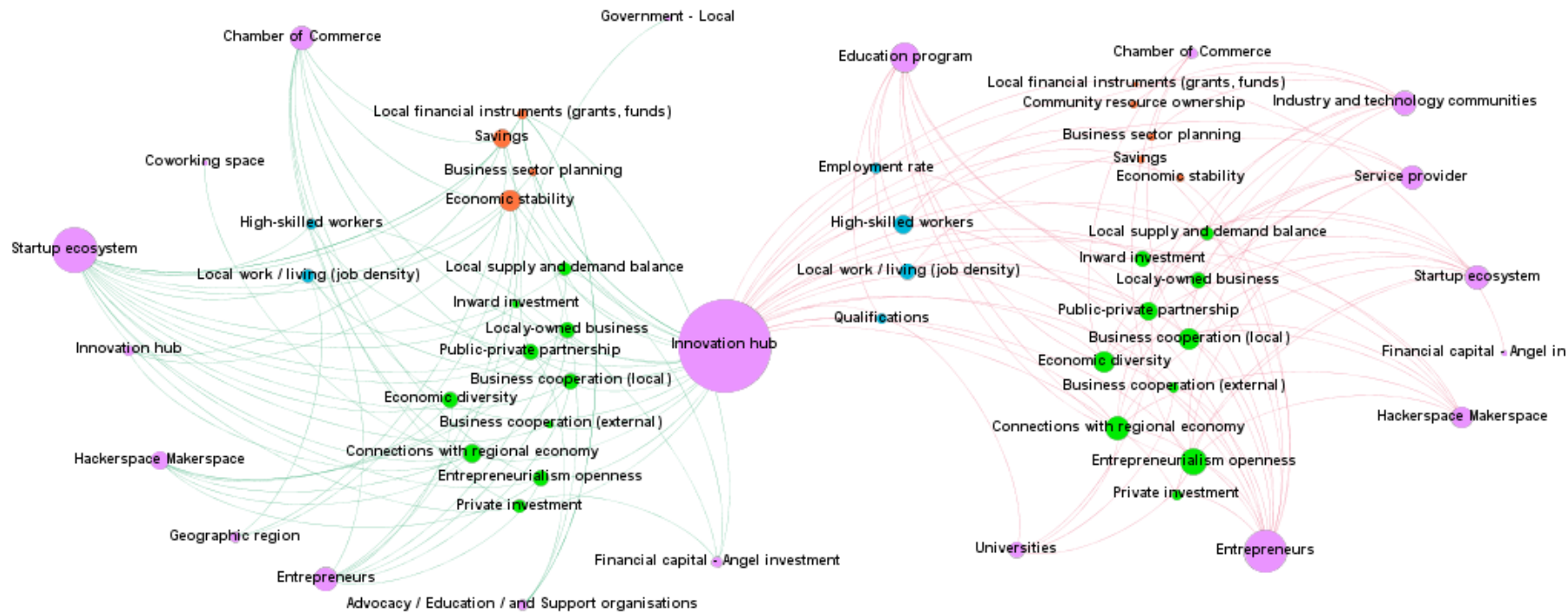
Figure 7-18 Enabling and inhibiting contributions of the innovation hub to the Social and individual Local culture subdimension indicators of community resilience

7.3.4 Economic

The Economic dimension included three subdimensions of Security, Dynamism, and Structure. The enabling and inhibiting factors defined in Chapter 6 associated with contribution of the innovation ecosystem towards the Economic dimension of community resilience are summarised in Table 7-5. The contributions from the role of the innovation hub are highlighted for each factor. Figure 7-19 provides a social network graph of the relationship between the innovation hub and other roles of the innovation ecosystem specific to the indicators of the Economic dimension.

Table 7-5 Summary of the innovation ecosystem's contribution towards the Economic dimension of community resilience

Enabling contribution factor to community resilience	Innovation hub contribution	Inhibiting contribution factor to community resilience	Innovation hub contribution
Additional support for early stage founders	Yes	Bureaucracy	Yes
Availability of local angel funding	No	Cost of startup support	Yes
Collaboration in providers and programs	Yes	Emphasis on high growth firms	Yes
Dedicated media	Yes	Exclusive language	Yes
Dedicated third space	Yes	Lack of access to talent	Yes
Engage established businesses	Yes	Lack of capability	Yes
Funding	Yes	Lack of funding	Yes
Integrated programs	Yes	Lack of motivation in Australian culture	No
Intermediary role between cultures	No	Lack of perceived value	Yes
Mentoring	Yes	Lack of program follow-through	Yes
Senior leadership and advocacy	Yes	Lack of reporting	Yes
Specialist focus	Yes	Lack of service provider curation / availability	Yes
Third space	Yes	Lack of specialist focus	Yes
		Lack of startup focus	Yes
		Lack of sustainable business model	Yes
		Lack of trust	Yes
		Local competition	Yes
		Low perception of value	Yes
		Operating in silos	Yes
		Remoteness	No
		Systemic social barriers	No



Legend

- Role: ●
- Dynamism subdimension: ●
- Security subdimension: ●
- Structure subdimension: ●

Figure 7-19 Social network graph of the contribution of the innovation hub to the Economic dimension of community resilience

The innovation hub was considered a significant contributing role to the dynamism subdimension (Figure 7-20). Service providers and established businesses engaged in local and external business cooperation, supporting the hub through technology, sponsorship and the creation of separate technology communities within the hub. The physical and local nature of the hub was identified by education programs and established businesses as providing a strong connection with the regional economy, bringing together businesses that might not otherwise be connected. The innovation hub introduced new types of business and industries to regions, a value highlighted by local governments for economic diversity. Established businesses and the community described situations of entrepreneurial openness, and roles financially supporting hub activity reflected inward investment. Diversity in entrepreneurial support, including multiple innovation hubs and coworking spaces, provided for local supply and demand balance as services specialised in industry and business stage of growth. Provision of support for later-stage business by innovation hubs and supported by local government enabled locally-owned businesses. The innovation hubs facilitated private investment by supporting the development of local angel investment groups, while private-public funding was enabled through government-owned innovation hubs, as well as co-funding programs by government, large corporations and established businesses.

Innovation hubs were also inhibitors to the dynamism subdimension. For example, local business cooperation was inhibited through increased competition for revenue-generating functions, such as coworking spaces and education program delivery, which were shared with other roles of real estate and other incubators. Limited resources restricted innovation hubs from responding to opportunities. Connection with the regional economy was inhibited by challenges inherent to regional areas of low population and access to resources and skills. Established roles (e.g., chamber of commerce) indicated that economic diversity was inhibited by established businesses not understanding or agreeing with the benefits of the innovation hub, a challenge observed to sometimes be generational. Innovation hubs required financial support beyond member fees, and securing financial support from other sources such as government or corporations was a challenge.

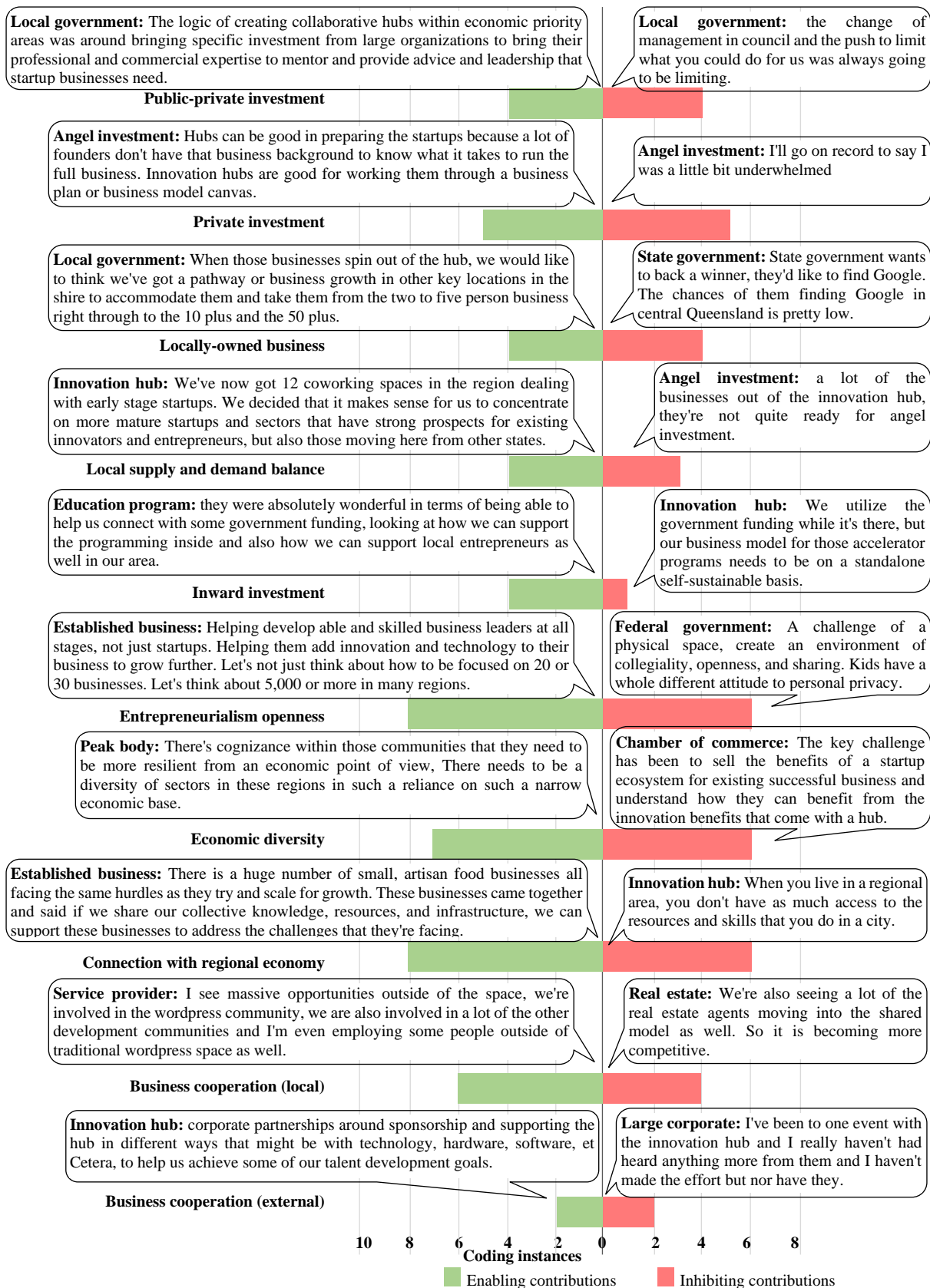


Figure 7-20 Enabling and inhibiting contributions of the innovation hub to the Economic Dynamism subdimension indicators of community resilience

An enabling and inhibiting contribution to economic security was identified for the innovation hub (Figure 7-21). Business sector planning was enabled when there was intentional alignment between private and public sectors and multiple levels of government but inhibited when innovation hub activities were not aligned with local government economic development and community development strategies. Roles, such as the chamber of commerce, commented on stability in membership in the innovation hub over time and through business development stages as a reflection on economic stability, while uncertainty in innovation hub funding inhibited economic stability for ecosystem support services in the region.

Innovation hubs did not provide funds directly to entrepreneurs themselves, but they did enable local financial instruments, such as support for identifying grants and grant writing. However, entrepreneurs who were capable or who did not see value in the hub could pursue these pathways themselves, securing grants and running programs without involving the hub. Entrepreneurs described the innovation hub as “*a safety net*”, with access to mentors and technical services enabling savings. However, entrepreneurs who did not feel comfortable in the hub or being taken advantage of by service providers and investors associated with the hub could lose significant savings.

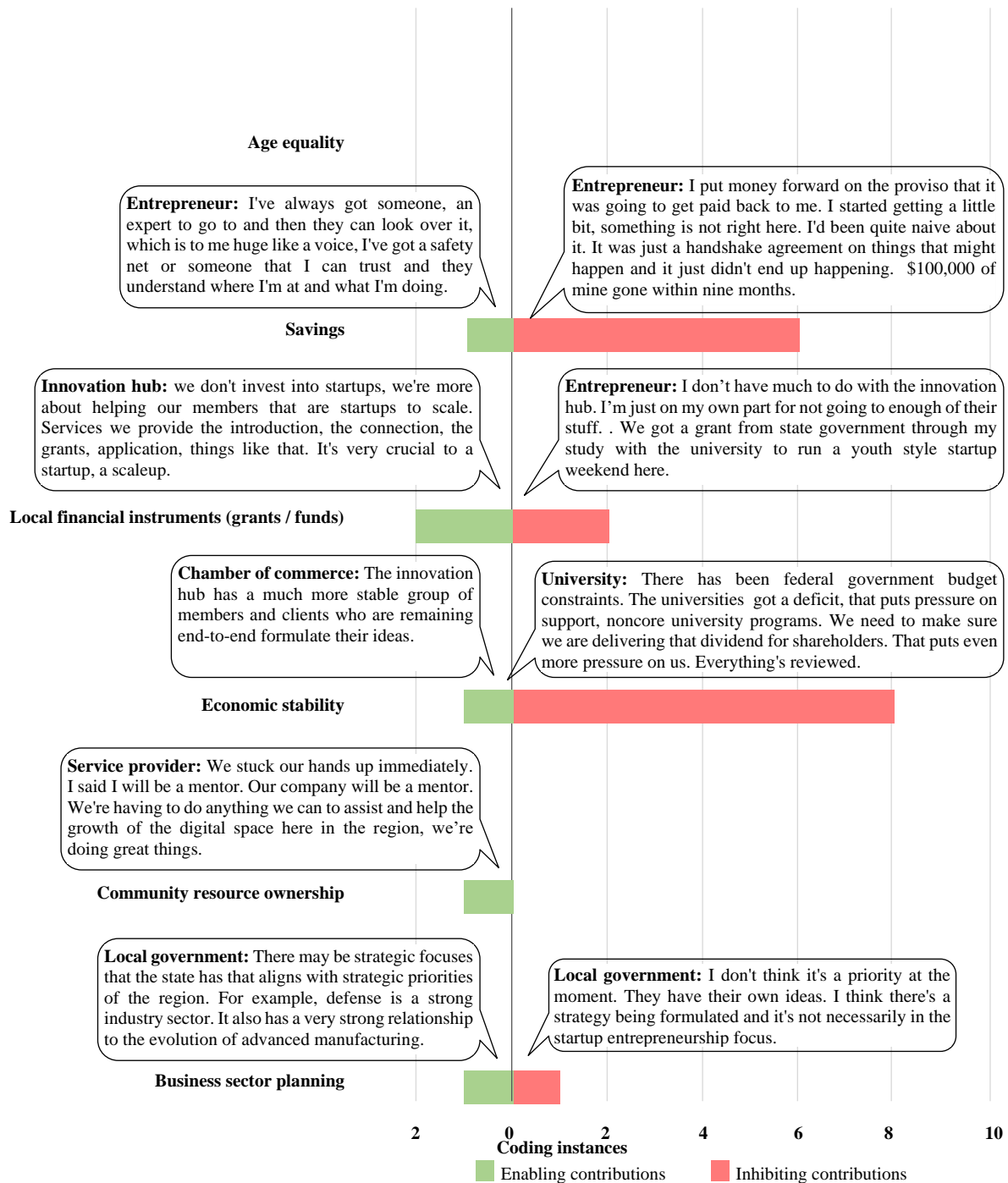


Figure 7-21 Enabling and inhibiting contributions of the innovation hub to the Economic Security subdimension indicators of community resilience

The innovation hub was largely viewed as enabling the economic structure subdimension (Figure 7-22). Innovation hubs introduced entrepreneurs to talented people, with examples provided of employment generated as a result of the hub engagement. Local governments described the innovation hub as enabling high skilled workers across the age range of youth to older workers needing to reskill. Employment, jobs, or customers were required as described by government, hubs, and universities to retain people in the region after they developed the

skills. The innovation hub had limited contribution towards a formal qualification, but relationships with universities did enable support for students in existing courses.

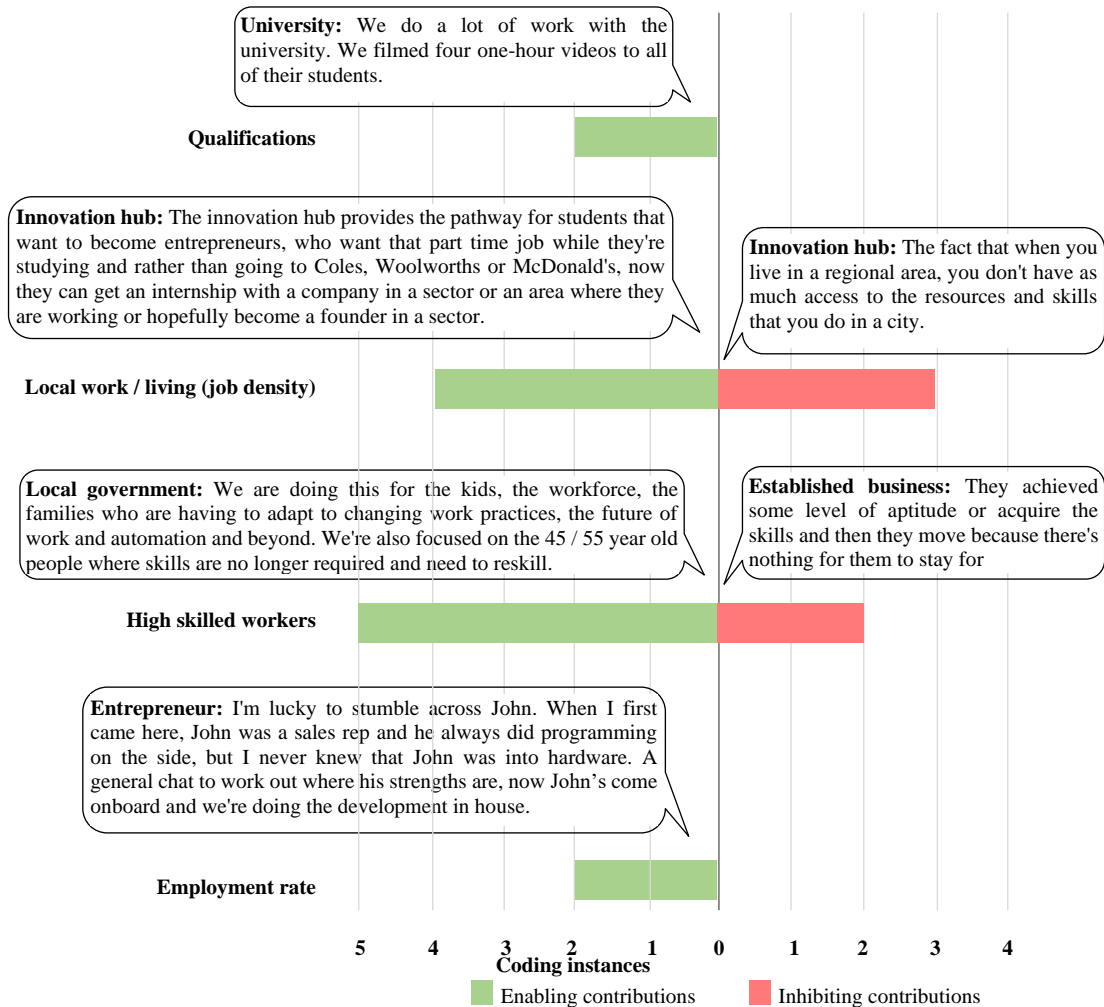


Figure 7-22 Enabling and inhibiting contributions of the innovation hub to the Economic Structure subdimension indicators of community resilience

7.4 Conclusion

Chapter 7 has provided the results of the research demonstrating the contribution of the innovation hub towards specific indicators of community resilience. The results were presented using social network graphs to display the relationship of the hub with other roles through a lens of the community resilience indicators. A separate focus was provided for the four dimensions of community resilience: Built environment/infrastructure, Institutional, Social and individual, and Economic. The enabling and inhibiting factors of the innovation ecosystem initially identified in Chapter 6 were highlighted in relations to the contribution of the innovation hub. A discussion of the results along with the results from Chapter 6 and Chapter 5 will now follow in Chapter 8.

CHAPTER 8: DISCUSSION, CONTRIBUTION, AND LIMITATION

8.1 Introduction

This thesis outlined prior literature related to the three main constructs of this research: the innovation ecosystem, innovation hubs, and community resilience. The review also identified a gap in literature that takes a systems view to combine and integrate these constructs. The constructs of the innovation ecosystem and the innovation hub were examined in the Australian context as part of a critical realist perspective that acknowledges the reality from literature and from what can be observed. This information informed the approach but did not prescribe outcomes, with Actor Network Theory applied to understand reality as described by individuals in community.

Chapter 8 discusses the results outlined in Chapter 5, Chapter 6, and Chapter 7 for each of the three respective research questions. Each of the research questions is discussed in turn in Section 8.3, Section 8.4, and Section 8.5.

- *RQ1: What is the role of the innovation hub in an innovation ecosystem?*
- *RQ2: How do innovation ecosystems contribute towards community resilience, and what are the enabling and inhibiting contributions?*
- *RQ3: What indicators of community resilience are influenced by an innovation hub, and what are the enabling and inhibiting contributions?*

8.2 The results and subsequent discussion for the research questions highlights three further considerations noted both from the research and in previous ecosystem research. These considerations are mentioned in this discussion rather than the methodology as they emerged from the results and are expanded upon here to allow the reader to understand how observations are framed in the discussion. The first consideration is the importance of context in interpreting the results and preparation for discussion. The second consideration is that of causality in deriving an observation or even a prescription from the data. Finally, consideration can be drawn from literature focused relating to unintended consequences of social change in complex systems which is of particular relevance for Observation 6 in both RQ2 and RQ3. These three considerations of context, causality, and unintended consequences are expanded upon in Section 8.2.Context, causality, and unintended consequences

It is important to understand the context in which the research was conducted, in that the framework of roles, actors, relationships, and environment was discovered as new knowledge resulting from this research. As outlined in Section 4-2, the Australian entrepreneur ecosystem and the nature of incubators and innovation hubs in the ecosystem were emerging and dynamic over the course of this research. Chapter 2 highlighted gaps in literature explicitly correlating innovation hubs, innovation ecosystems, and community resilience. The lack of existing research and emerging nature of the Australian innovation ecosystem influenced the broad nature of the research questions to address questions of not just how but if innovation hubs and the innovation ecosystem contributed towards community resilience.

As a result, a new conceptualisation was developed that included roles, functions, contributing factors, and community resilience indicators. This conceptualisation is itself the response to the research question. General observations pertaining to the framework are discussed for each question in turn through Chapter 8.

The framework provides a lens against which to view innovation ecosystems and naturally leads to questions of causality. As the reader considers the observations included in this research, it is expected that they will develop further logical questions such as in which situations factors are more or less likely to contribute towards community resilience, the presence of other variables such as innovation hub funding models or types, or the cultural

history of the local ecosystem. The research sacrificed questions as to why contributions might occur for an exclusive focus on demonstrating the presence of the perceived contribution across the innovation ecosystem and naming contributing factors. The question of causality provides rich opportunities for further research.

Finally, the research identified the presence of unintended consequences, emphasised in RQ2 and RQ3 Observation 1 relating to enabling and inhibiting contribution and Observation 6 relating to current inhibiting contributions resulting in future resilience. These observations support other research that identified unintended consequences of innovation ecosystem activity (Brown & Mawson, 2016; Audretsch, Cunningham, Kuratko, Lehmann, & Menter, 2018). These unintended consequences are often framed as presumed enabling factors being experienced or realised as inhibiting factors by varying roles, reflected as the ‘dark side’ or social research (Gras, Conger, Jeenkins & Gras, 2020; Spigel & Harrison, 2017; Muldoon, Bauman & Lucy, 2018). The awareness and acceptance of unintended consequences is helpful in reviewing the results discussion.

8.3 The role of the innovation hub in the innovation ecosystem (RQ1)

The innovation ecosystem is an established concept, albeit with some ambiguity. Recent studies consolidate past research in an attempt to reconcile this ambiguity, highlighting the interest in the topic and also perhaps the challenge of the task (Gomes et al., 2016; Oh et al., 2016; Meshram & Rawani, 2019; Stam, 2015; Velt, Trorkkeli & Laine, 2020; Rakas & Hain, 2020; Dias, de Souza Bermejo, Moreira, & de Souza, 2020; Maroufkhani, Wagner & Ismail, 2017). The discussion below considers the observed reality of roles and functions described by interview respondents against what can be known from previous research, with an emphasis on the role of the innovation hub.

Over 157 roles were identified in a review of 18 current innovation ecosystem models, outlined in Table 8-1. A brief review of the roles identified in existing models from literature highlights variances in literature. First, models can use different terms to describe the basic constructs of the system, such as ‘actors’, ‘factors’, ‘organisational actors’, ‘roles’, and ‘domains’. Second, roles can be described with different granularity levels, from the general ‘industry’ or ‘business’ to the more specific and descriptive ‘large established companies’ or ‘anchor firms’. Third, language can be used that is unique to the model, such as ‘leaders and feeders’ (Feld, 2012) or terms that are overly general, such as ‘support’ or ‘market’. Fourth, models can mix

institutions, such as ‘universities’ and ‘government’, with concepts such as ‘future-orientated knowledge’ and ‘macroeconomic conditions’. Finally, there can be varying levels of detail and descriptiveness between models describing similar concepts, such as ‘support services’, ‘support entities’, ‘support system’, and ‘support professions’.

Literature was reviewed with a focus on understanding how the role of the innovation hub is conceptualised in other ecosystem models and frameworks. Section 2.2 and Section 2.3 in this thesis outlined the evolution of the innovation ecosystem models as place-based innovation systems. Section 2.5 clarified the depiction from literature of the role of the innovation hub as one form of incubator for entrepreneurs and innovation within the innovation ecosystem. The perspectives from literature were considered and summarised to inform the review of the Australian context and focus on the evolution of the Queensland ecosystem in Section 4.2.

Table 8-1 Roles identified in 18 innovation ecosystem models

Article	Construct	Roles	Context
Engel, J. S. (2015) <i>Global Clusters of Innovation: Lessons from Silicon Valley</i>	Cluster of Innovation	Universities, Government, Entrepreneurs, Venture capital, Mature corporation, Industrial research centres, Service providers, Management	Silicon Valley, Europe and Middle East, Asia and Latin America
Feld, B. (2012) <i>Startup Communities: Building an Entrepreneurial Ecosystem in Your City</i>	Entrepreneurial ecosystem	Entrepreneurs, Government, Universities, Investors, Mentors, Service Providers, Large companies, Leaders and Feeders	Boulder, CO
Hwang, V. W. & Horowitz, G. (2012) <i>The Rainforest: The Secret to Building the Next Silicon Valley</i>	Rainforest	Keystone individuals, Keystone institutions, Entrepreneurs, Hubs	Global
LaunchVic, <i>Mapping Victoria's Startup Ecosystem (2017)</i>	Startup ecosystem	Startups, Meetups, Coworking spaces, Professional support, External connections, Founders, mentors	Victoria, AU
LaunchVic <i>Startup Guide (2017)</i>	Startup ecosystem, as viewed by local government	Community centres, Meetups, Hackathons, Mentor programs, Coworking spaces, Makerspaces, Master class sessions, Accelerator programs, Incubators, Pitch-fests, grants and incentives, Investor networks, Upgraded office spaces, Digital infrastructure, Tax specialists, Specialised labour pool, Logistics and distribution centres, International government consuls, International partners	Victoria, AU
Global Entrepreneurship Research Association (2018) <i>Global Entrepreneurship Monitor</i>	Entrepreneur ecosystem	Entrepreneurial financing, Government policies, Government entrepreneurship programs, Entrepreneurship education at school stage, Entrepreneurship education at post-school stage, Entrepreneurship training, Research & Development transfer, Commercial and legal infrastructure, Internal market dynamics, Physical infrastructure, Culture and social norms	Global
Domains of the Entrepreneurship Ecosystem (Isenberg, 2011)	Entrepreneurship ecosystem	Policy (Leadership, Government), Finance (Financial Capital), Culture (Success Stories, Societal Norms), Supports (Non-government initiatives, Support professions, Infrastructure), Human Capital (Labour, Educational institutions), Markets (Networks, Early customers)	Global
Startup Genome (2018) <i>Global Startup Ecosystem report</i>	Startup ecosystem, Success factors	Founder, Talent, Funding, Startup experience, Global connectedness, Local connectedness, Global market reach, Organisations, Economic impact	Global
REDI: <i>The Regional Entrepreneurship and Development Index – Measuring Regional Entrepreneurship (2013)</i>	Systems of entrepreneurship	Entrepreneurial attitudes (Opportunity perception, Startup skills, Risk acceptance, Networking, Cultural support), Entrepreneurial abilities (Opportunity startup, Technology adoption, Human capital, Competition), Entrepreneurial aspiration (Product innovation, Process innovation, High growth, Globalisation, Financing)	Regional areas
Aspen Network of Entrepreneur Develop (2013) <i>Entrepreneurial Ecosystem Diagnostic Toolkit (2013)</i>	Entrepreneurial ecosystem	Policy, Finance, Infrastructure, Markets, Human capital, Support / services / connections, Culture, R&D / Innovation, Quality of life, Macroeconomic conditions	Global
Australian Innovation System report (2016)	Innovation system	Innovation activities (R&D, Entrepreneurial activity, Innovation funding, Training), Networks (Communities of practice, Joint research arrangements, industry-research collaboration, public procurement of private sector outputs), Framework conditions (history of the innovation system in action)	Australia
Rinkinen, S. (2016) <i>Clusters, Innovation systems, and Ecosystems: Studies on innovation policy's concept evolution and approaches for regional renewal</i>	Cluster, innovation system, ecosystem	Business ecosystem and niche development, Ecosystem-based innovation policy, Place-based policy, Future-orientated knowledge, Sustainability	Finland
Carayannis et al (2017) <i>The ecosystem as helix</i>	Helix	University, Civil society, Industry, Government, Environment	Regional
Espoo Innovation Garden (2015) <i>Orchestrating Regional Innovation Ecosystems</i>	Innovation hubs	Universities and research institutions, Financing, Large established companies, Startups, Specialised service-based companies, Local markets for new innovative products, Global networking, Culture (a 'community of fate where actors see their success linked to the success of the whole region).	Espoo, Finland

Article	Construct	Roles	Context
Cavaye, J. (2015) Review of Regional Development: Issues, Approaches and Directions in Innovation Regional Development Queensland, Centre for Rural and regional Innovation – Queensland	Innovation in regional communities	Federal government, State government, Local government, Community Organisations including Indigenous groups, Universities and research organisations, R&D Corporations, Industry bodies and Corporations, Business, Natural resource management groups e.g. Regional bodies	Queensland regional areas
White, Hechevarría, Terjesen, Acs & Audretsch (2016) The Tampa Bay Entrepreneurial Ecosystem: The Tide is High	Entrepreneurial ecosystem	Academic, Accelerator / Incubator / Makerspace, Co-working, Events, Government / Agency, Investment, Professional Organisation, Information resource	Tampa Bay
World Economic Forum (2013) Entrepreneurial ecosystem pillars	Entrepreneurial ecosystem	Accessible markets, Funding and finance, Regulatory framework and infrastructure, Major universities as catalysts, Human capital / workforce, Support system, Education and training, Cultural support	Global
Meshram & Rawani (2019) Understanding Entrepreneurial Ecosystem	Entrepreneur ecosystem	Accessible Market, Business consortiums, Capital, Commercial Infrastructure, Communities of agents, Companies, Cultural and Social Norms, Cultural Support, Cultural values, Culture, Demand, Economic policies, Education and Training, Engagement, Entrepreneurial actors, Entrepreneurial organizations, Entrepreneurial Orientation, Entrepreneurial processes, Environmental support, Finance, Financial Support, Formal and informal network, Formal Institutions, Funding and Finance, Government, Government and Regulatory Framework, Government Policy, Government Programs, Government support, Human Capital and Workforce, Human Resource, Institutions, Internal Market, Investment capital, Knowledge, Leadership, Localized cultural outlooks, Major Universities as Catalysts, Market, Market support, Moral support, Network, Network support, Physical infrastructure, Policy, Public & private funding agencies, R & D Transfer, Research organizations, Social networks, Social structures, Social support, Support, Support entities, Support Services, Support System / Mentors, Talent, Technology support, Universities	Consolidation of nine conceptualisations of entrepreneur ecosystems
Spigel, (2020) Entrepreneurial Ecosystems: Theory, Practice, and Futures	Entrepreneur ecosystem	Actors: Entrepreneurs, Investors, Skilled workers, Role models, Support professions and deal makers Factors: Culture, Network, Public policy, Markets and early customers, Physical infrastructure Organisational actors: Universities, Anchor firms, Incubators, accelerators, and support organisations	Global

The lack of clarity on roles in the innovation ecosystem was also found in relation to the term ‘innovation hub’, which was not explicitly identified as a role in the 18 models from literature. The innovation hub was inferred through roles such as ‘incubators’, ‘hubs’, or ‘support services’. Other literature focuses specifically on forms and functions of incubators (Aerts et al. 2007; Cooper, 1985; Barrow, 2001; Amezcua, 2013; Hackett & Dills, 2004). The review of incubator taxonomies from literature in Section 2.5 and innovation hub representation in Australia in Section 4.4 highlighted a lack of consistency in the use of the terms ‘hub’, ‘incubator’, and ‘precinct’.

This research did not set out to test or prove predefined models, but to use existing models combined with observations of the Australian context to inform the selection of interviewees

and corroborate interview data. The use of actor network theory and a critical realist perspective allowed for roles and functions to emerge from the interviews from the perspectives of individuals experiencing the innovation ecosystem in their community. As described in Section 3.3, this was to account for the changing nature of the environment in which the innovation ecosystem is applied, accommodate varying perspectives between regions and over different historical context, and allow for different levels of individual awareness of innovation ecosystem models and concepts.

The research outlined in Section 5.2 identified 47 roles from the interviews grouped into 17 categories. Existing models from Table 8-1 were reviewed to inform the research but did not dictate the roles identified in the research. Figure 8-1 shows a network graph of roles identified in this research mapped to roles identified in existing literature.

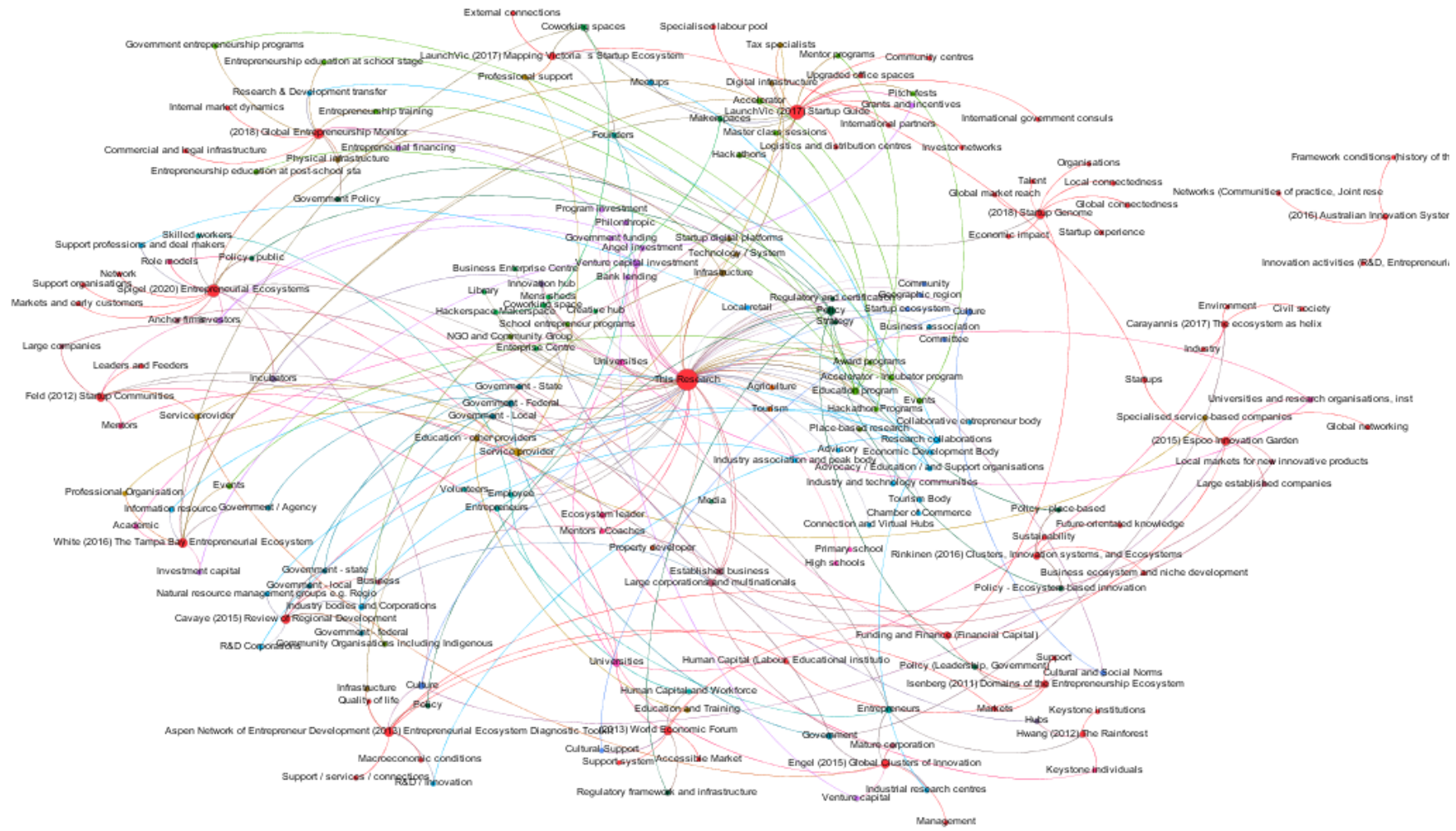


Figure 8-1 Innovation ecosystem roles from established models and this research

A comprehensive comparison of roles between theoretic models of the innovation ecosystem is outside the scope of this research. However, the analysis of the research results against other models does offer insights relevant to the role of the innovation hub in the innovation ecosystem. A review of the network map highlights four conditions that can be identified from the research (Table 8-2).

Table 8-2 Analysis framework for roles in the innovation ecosystem

	Role identified in literature	Role identified in this research
Condition 1	Yes	Yes
Condition 2	Yes	No
Condition 3	No	Yes
Condition 4	No	No

First, the network map is reviewed for direct correlations of roles identified from interviews in this research and roles from other models. As previously noted, the innovation hub is absent as a construct in other models. Other references of ‘incubator’ (Spigel, 2020) and ‘hubs’ (Hwang et al, 2012) could refer to the role of the innovation hub. The lack of reference in literature can contribute to challenges with a consistent understanding of the term ‘innovation hub’, compounded the current lack of consistency in popular naming conventions noted in Chapter 4.

Second, the network map is reviewed for roles that are present in models that are not associated with roles identified in the interview process from this research. Roles such as ‘external connections’ (LaunchVic, 2017) and ‘global connectedness’ (Startup Genome, 2018) were considered in this research as both functions in the innovation ecosystem, as well as indicators of community resilience, rather than dedicated roles. Other roles from literature such as ‘business ecosystem and niche development’ (Rinkinen, 2016) and ‘support system’ (World Economic Forum, 2013) were broad and could include the innovation hub, but were not directly mapped to roles identified in this research.

Several roles from existing research can be identified in the interview narratives. Roles in research such as talent, network, and market were mentioned but not explicitly coded. Other roles in existing literature can be specific focus areas, such as government regulatory framework that could be considered a function of government. One role that was surprising not to have been coded in the research is ‘startup’. This is due perhaps to references to the firm of the startup role being considered synonymous in many interview narratives with the individual of the startup founder. This distinction can be explored in more detail in future research.

Third, the network map is reviewed for roles identified in this research that are not apparent in models from literature. This research identified a level of granularity and specificity not explicitly present in existing models. For example, the role in this research of ‘property developer’ could relate to ‘upgraded office space’ (LaunchVic, 2017) but the emphasis is on the role of the developer as an agent as compared to the function of the physical space. The role in this research of ‘local retail’ places emphasis on the local amenities and lifestyle that support physical place-based innovation hubs, a concept perhaps reflected in other models as a general ‘quality of life’ (Aspen Network of Entrepreneur Development, 2013) or ‘local connectedness’ (LaunchVic, 2017).

Finally, there could be a condition whereby there are roles not identified in this research and not present in existing literature. The characteristic of emergence in the complex adaptive system of the innovation ecosystem provides the opportunity for new roles to develop as existing roles evolve and adapt based on market demands and opportunities (Van de Ven, 1993). A space is needed for roles to be considered that may not fit established models. The four categories of roles based on existing research and this research are outlined in Table 8-3.

Table 8-3 Innovation ecosystem roles in literature and this research

Innovation ecosystem roles identified models conceptualisation in existing research	Present	<ul style="list-style-type: none"> • Accessible Market • Business consortiums • Business ecosystem and niche development • Civil society • Commercial and legal infrastructure • Commercial Infrastructure • Communities of agents • Community centres • Demand • Economic impact • Economic policies • Engagement • Entrepreneurial actors • Entrepreneurial organisations • Entrepreneurial Orientation • Entrepreneurial processes • Environment • Environmental support • External connections • Formal and informal network • Formal Institutions • Framework conditions (history of the innovati • Future-orientated knowledge • Global connectedness • Global market reach • Global networking • Government and Regulatory Framework • Government Programs • Human Capital • Human Resource • Industry • Innovation activities • Institutions • Internal Market • Internal market dynamics • International government consuls 	<ul style="list-style-type: none"> • International partners • Investor networks • Keystone institutions • Knowledge • Leaders and Feeders • Leadership • Local connectedness • Localized cultural outlooks • Logistics and distribution centres • Macroeconomic conditions • Major Universities as Catalysts • Management • Market support • Markets • Markets (Networks, Early customers) • Markets and early customers • Moral support • Network • Network support • Organisations • Quality of life • R & D Transfer • Social networks • Social structures • Social support • Specialised labour pool • Startup experience • Startups • State government • Support • Support / services / connections • Support entities • Support organisations • Support Services • Support system • Support System / Mentors • Supports (Non-government initiatives, Support • Sustainability • Talent • Technology support • Upgraded office spaces 	<ul style="list-style-type: none"> • Academic • Accelerator • Anchor firms • Business • Community Organisations including Indigenous • Coworking spaces • Cultural and Social Norms • Cultural Support • Culture • Digital infrastructure • Education and Training • Employees • Entrepreneurial financing • Entrepreneurs • Entrepreneurship education at post-school stage • Entrepreneurship education at school stage • Entrepreneurship training • Established business • Events • Founders • Funding and Finance (Financial Capital) • Government • Government - federal • Government - local • Government - state • Government / Agency 	<ul style="list-style-type: none"> • Government entrepreneurship programs • Government Policy • Grants and incentives • Hackathons • Hubs • Human Capital and Workforce • Incubators • Industrial research centres • Industry bodies and Corporations • Industry bodies and Corporations • Information resource • Infrastructure • Innovation hub • Investment capital • Investors • Investors • Keystone individuals • Large companies • Large established companies • Local markets for new innovative products • Makerspaces • Master class sessions • Mature corporation • Meetups • Mentor programs • Mentors • Natural resource management groups e.g. Regio 	<ul style="list-style-type: none"> • Physical infrastructure • Pitch-fests • Policy • Policy - Ecosystem-based innovation • Policy - place-based • Policy - public • Policy (Leadership, Government) • Professional Organisation • Professional support • R&D / Innovation • R&D Corporations • Regulatory framework and infrastructure • Research & Development transfer • Role models • Service provider • Skilled workers • Specialised service-based companies • Support professions and deal makers • Tax specialists • Universities • Venture capital • Research organisations • NGO and Community Group • Education - other providers • Large corporations and multinationals • Industry association and peak body
	Not present	Emerging roles	<ul style="list-style-type: none"> • Advisory • Agriculture • Award programs • Bank lending • Business Enterprise Centre • Chamber of Commerce • Collaborative entrepreneur body 	<ul style="list-style-type: none"> • Committee • Community • Creative hub • Geographic region • High schools • Library • Local retail • Media • Men's sheds 	<ul style="list-style-type: none"> • Philanthropic • Primary school • Property developer • Startup digital platforms • Startup ecosystem • Technology / System • Tourism • Volunteers 	
	Not present	Present				
	Innovation ecosystem roles identified in this research					

The structure of roles in the innovation ecosystem, or the order of the parts, is complimented by the functions of the roles, or the order of processes (von Bertalanffy, 1968). As part of establishing the role the innovation hub played in the innovation ecosystem, 21 functions were identified in the interviews that were performed by the innovation hub and shared by other roles in the innovation ecosystem. The functions identified for the innovation hub are detailed in Section 5.3 and grouped into four categories as outlined in Section 5.4.

The categories of functions are based on the frequency of the function being identified in the interview. Core functions relate to delivery of innovation hub outcomes and often associated with revenue generation. Internal functions focus on building capacity and capability in innovation hub service delivery. External influence functions focus on the external environment in which the innovation hub had influence and supports development of the overall ecosystem. Finally, External concern functions are those not seen as performed by the innovation hub but that would be a concern to the hub's outcomes and impact.

Using social network analysis, the results are reviewed to determine other roles that shared functions with the innovation hub, as discussed in Section 5.4 and depicted again in Figure 8-2. The discussion considers what functions are being performed, the types of roles that can perform those functions, and how those roles can interact through performing the functions. The value of the network was not considered for the quality of the relationships or value of the interaction, but the presence of other roles in the performing of then function to consider the role of the innovation hub in the innovation ecosystem.

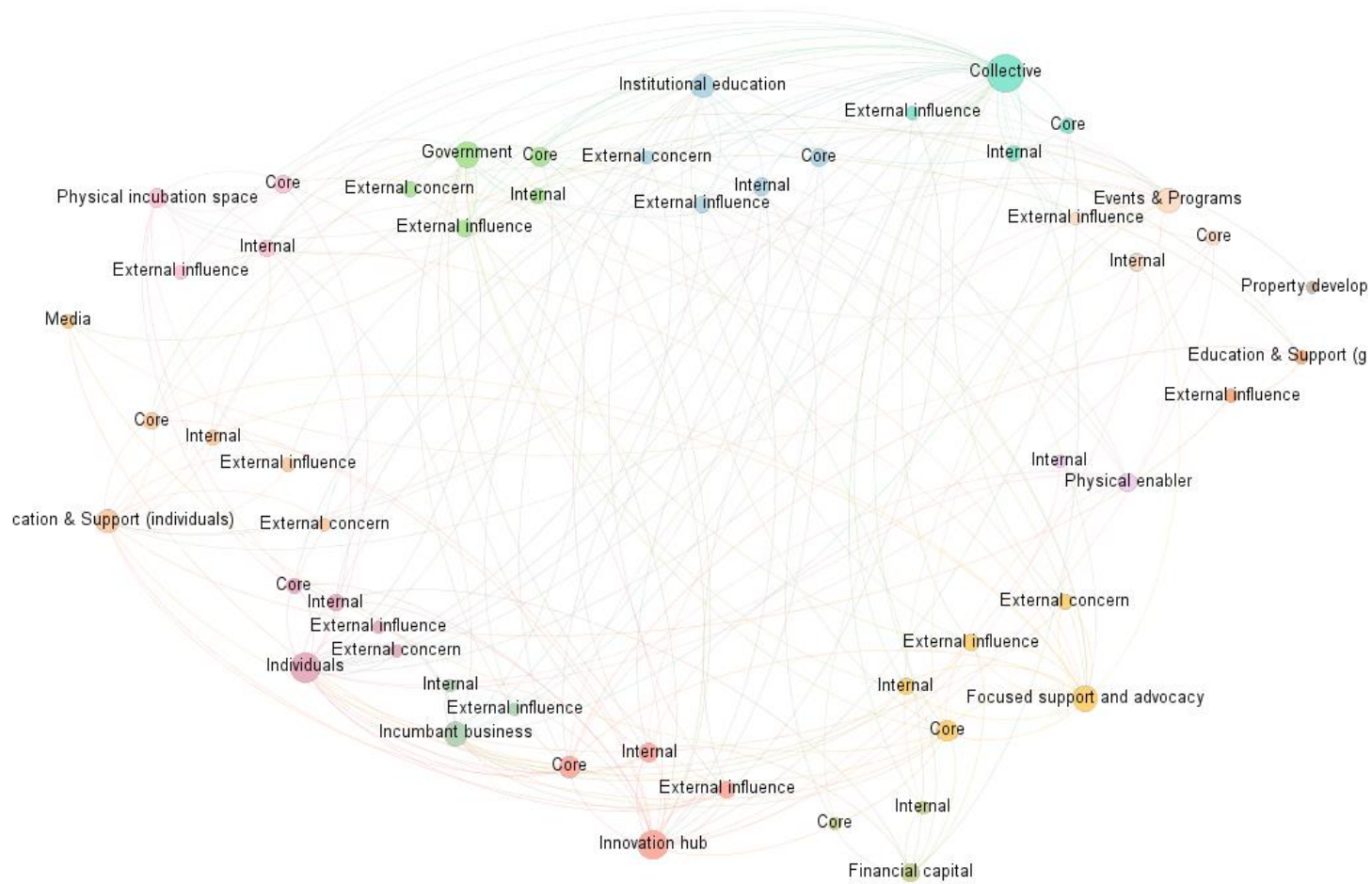


Figure 8-2 Shared groups of functions by role type in the innovation ecosystem

The direction of the relationships in the network graph are depicted in Table 8-4. The table depicts role categories in the innovation ecosystem and the direction of the relationship as the function is performed. As the innovation hub is the role of focus for this research, the direction of action is depicted based on the innovation hub. Roles performed functions with other roles outside of the innovation hub that are not depicted in Table 8-4.

Table 8-4 Network direction between roles in the innovation ecosystem relative to the innovation hub

Role category	Core		Internal		External influence		External concern		Innovation hub
	←	→	←	→	←	→			
Collective	←	→	←		←	→			
Education and support (groups)	←	→							
Education and support (individuals)	←	→		→	←				
Events and programs	←	→	←	→					
Financial capital	←	→	←						
Focused support and advocacy	←	→							
Government	←	→	←	→	←	→		→	
Incumbent business	←		←	→	←				
Individuals	←	→	←	→	←				
Institutional education	←	→	←	→	←	→			
Media	←		←						
Physical enabler	←		←	→					
Physical incubation space		→							
← = Innovation hub acting on external role									
→ = External role acting on innovation hub									

An established body of literature details functions in innovation ecosystems, outlined in Section 2.3 as a form of ‘organisational sponsorship’ (Flynn, 1993; Amezcua et al., 2013; Breivik-Meyer et al., 2019). Functions and business models of various forms of incubators have also been proposed (Hausberg & Korreck, 2020; Bergek & Norrman, 2008; Albort-Morant & Ribeiro-Soriano 2016; Hackett & Dilts 2004; Mian et al. 2016; Phan et al. 2005). Barrow (2001) proposed categories of premises, business services, management and business strategy services, and finance and financial consulting. Breivik-Meyer et al. (2019) apply an organisational sponsorship framework to incubators where functions provide a buffering or bridging affect for new firms. In their comprehensive literature review, Hausberg and Korreck (2020) refer to functions as incubation processes grouped into three subsections of search and selection, business support, and mediation. The functions raised in this research are supported by functions identified in past research.

An interesting and unique outcome that emerged from this research is the grouping of roles from the perspective of meaning to the innovation hub. Most research focuses on the value of organisational sponsorship services from the value delivered to the recipient and only occasionally considers framing the delivery based on accountabilities of the role and what might have value for each role in the relationship. This is important particularly for the fragile business model of the incubator where financial sustainability of service delivery is essential to sustainable outcomes in the community (Seo et al., 2017; Kovács & Zoltán, 2017).

This research is informed and inspired by research of Cavaye (2015) that considers the matrix of roles in a place-based context and their functions that contribute towards key issues in a region. RQ1 expands on prior research to establish the role of the innovation hub as it relates to other roles and define the innovation hub's position by unique and shared functions from the perspective of the innovation hub. The research also raised opportunities for future research to further describe the nature of the relationship between roles. For example, the collaborative, competitive, and cooperative nature of network relationships is a focus for a stream of research from the perspectives of government-driven ecosystems (Jung, Eun & Lee, 2017), member-based organisation models (Huxham & Vangen, 2000), regional context (Lee, Lee & Feiock, 2012), sector context such as tourism (Perkins & Khoo-Lattimore, 2020), project-based collaboration (Grabher, 2002), and within individual roles such as coworking spaces (Bouncken, Laudien, Fredrich & Gormar, 2018). Each of these focus areas were evident in this research. The depiction of Core, Internal, External influence and External concern roles provides a useful frame for future research to assess the nature of role relationships.

8.4 The role of the innovation ecosystem in contributing to community resilience (RQ2)

RQ2 examined the role of the innovation ecosystem in contributing to community resilience and addressed gaps in literature demonstrating the link between innovation ecosystems and community resilience outcomes (Bristow & Healy, 2018; Simmie, 2014). The results in Chapter 6 identified 61 enabling and 62 inhibiting contributing factors that the innovation ecosystem has on dimensions of community resilience. The findings from the current research align with past research that focuses on specific aspects of community resilience. This research is unique in taking a holistic perspective across roles and community resilience dimensions.

Past research has examined broadly the framework conditions for entrepreneurial ecosystems and support services (Audretsch & Belitski, 2017; Spigel & Harrison, 2015; Isenberg, 2011;

Feld, 2012) and community resilience in general (Noriss et al., 2008; Meerow et al., 2016; Adekola & Clelland, 2020; Bristow & Healy, 2018). Prior research has also focused on the contribution of most roles observed in the innovation ecosystem, such as universities (Breznitz, Clayton, Defazio & Iset, 2018; Ranga, Mroczkowski & Araisio, 2017), government (Mazzucato, 2018; Sun, Zhang, Cao, Dong & Cantwell, 2019), incubators (Breivik-Meyer et al., 2019), media (Laguia & Moriano, 2019), hackathons (Irani, 2015), hackerspaces/makerspaces (Holm, 2017), incumbents (Buenstorf, 2016), investment (Pierrakis & Saridakis, 2019), and more. Previous research has also focused on the impact of the innovation ecosystem on specific aspects of community resilience, for example institutional and social/individual dimensions referred to as ‘socio-cultural barriers’ (Walsh & Winsor, 2018). Further examples of prior research associated with individual dimensions along with instances of enabling and inhibiting contributions from this research are outlined in Table 8-5, Table 8-6, Table 8-7, and Table 8-8.

Table 8-5 Innovation ecosystem contribution to community resilience – Social and individual dimension)

Dimension	Subdimension	Criteria	Expected contribution prior to interviews		Research results				Support from existing literature
			Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	
Social and individual	Social structure	Population composition	Moderate	+	7	11	7	19	Scerb, Lafuente, Horvath & Pager (2019)
		Language abilities	Low	+	0	0	2	3	Kuratko, Fisher, Bloodgood & Hornsby (2017)
		Diverse skills (to pool skills at time of disaster)	High	+	26	101	15	59	Commonwealth of Australia, (2016)b
	Community bonds, social support, and social institutions	Degree of connectedness across community groups	High	+	24	82	16	45	Pierrakis, Y. & Saridakis, G. (2017); Yasuyuki & Knowlton (2016)
		Volunteerism and civic engagement in social networks	High	+	22	80	17	45	Villegas-Mateos & Vazquez-Maguirre (2020); Mandrysz (2020)
		Collective memories, knowledge, and experience	High	+	18	57	7	8	Roundy & Fayard (2020)
		Trust, norms of reciprocity	High*	+/-	19	72	18	51	Muldoon, Bauman & Lucy, (2018)
		Shared assets	High	+	10	30	3	8	Gallagher & Ehlam (2019)
		Strong international civic organisations	High	+	2	2	1	1	Bischoff, Volkmann & Audretsch (2018)
		Place attachment and sense of community pride	High*	+/-	16	40	6	18	Morrison, Ramsey & Bond (2017)
		Existence of conflict resolution mechanisms	Moderate	+	6	10	7	12	Bouncken, Laudien, Fredrish, & Gormar (2018)
		Empowerment and engagement of vulnerable groups, social safety-net mechanism	High*	+/-	10	22	7	11	Igwe, Odunukan, Rahman, Rugara & Ochinanwata (2020)
		Boundary spanning (global)			7	10	2	2	Xie, Xie, Martinez-Climent (2019); Bischoff, Volkmann & Audretsch (2018); Harima, Harima, & Freiling (2020)
	Safety and well-being	Psychological health	Moderate*	+/-	13	40	8	17	Baikadi (2016); OECD (2019); Audretsch & Belitski (2015)
		Preventive health measures	Moderate*	+/-	2	2	1	1	OECD (2019)
	Equity and diversity	Gender norms and equality	High*	+/-	3	4	3	5	Sperber & Linder (2019); ABS (2020)
		Ethnic equality	Moderate*	+/-	5	6	1	1	Elo, Taube & Volovelsky (2019)
		Involvement of minorities	Moderate*	+/-	8	11	2	3	Elo, Taube & Volovelsky (2019)
		Involvement of population with special needs	Low*	+/-	7	11	1	2	OECD (2019)
		Diverse workforce in culturally diverse places	Moderate*	+/-	3	3	5	7	Elo, Taube & Volovelsky (2019)
	Decency, affordability, and fair access to basic needs, infrastructure and services	Moderate	+	1	1	4	5	Cowell, Lyon-Hill & Tate (2017)	

			Expected contribution prior to interviews		Research results				
Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	Support from existing literature
		Age (mature)			3	3	1	1	Maritz & Eager (2017); Perenyi, Zolin & Maritz (2017)
		Age (youth)			11	17	3	4	Bublitz, Chaplin, Peracchio, Cermin et al. (2020)
	Local culture	Past experience with disaster recovery; learning from the past	High*	+/-	3	3	0	0	Kwong, Cheung, Manzoor & Rashid (2018);
		Past experience with ecosystem building or startup founding; learning from the past			0	0	2	2	Harima, Harima, & Freiling (2020)
		Culture and historical preservation; indigenous knowledge and traditions	Moderate*	+/-	4	4	1	1	Wood & Davidson, 2011; Maritz & Foley, 2018
		Considering and respecting local culture and specificities in the process	Moderate*	+/-	5	5	4	4	Walsh & Winsor, (2018)
		Positive social, cultural, behavioural norms	High*	+/-	17	49	6	13	Feld (2012); Feld & Hathaway (2020)

Table 8-6 Innovation ecosystem contribution to community resilience - Economic dimension)

Dimension	Subdimension	Criteria	Expected contribution prior to interviews		Research results				Support from existing literature
			Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	
Economic	Structure	Employment rates and opportunities	High*	+/-	10	16	0	0	Fuzi (2015); Isenberg (2011)
		Income (equality, multiple sources), poverty	High*	+/-	2	3	3	3	Neumeyer, Santos & Morris (2019)
		Age structure of working population	High*	+/-	5	7	2	2	Maritz & Eager (2017); Perenyi, Zolin & Maritz (2017); Bublitz, Chaplin, Peracchio, Cermin et al. (2020)
		Qualifications of working age population	Moderate*	+/-	4	9	0	0	Castro, Scheede & Zermeno (2019)
		Individuals with high and multiple skills; literacy (education)	High*	+/-	14	35	6	10	Castro, Scheede & Zermeno (2019)
		Job density (housing-work proximity; extent of out-commuting)	High	+	12	36	6	13	Ensign & Farlow (2016)
	Security	Individual and community savings	High*	+/-	5	5	8	16	Bahrami & Evans (1995)
		Collective ownership of community resources	Moderate	+	3	3	3	3	Simmons, Wiklund, Levie, Bradley & Sunny (2019)
		Business mitigation, response, and redevelopment plan	High	+	6	8	7	8	Cumming, Werth & Zhang (2019)
		Financial instruments (Contingency funds, operating funds, capital funds, etc.)	High	+	7	30	11	15	Pierrakis & Saridakis (2017)
		Stability of prices and incomes	Moderate	+	8	14	14	25	Growth, Esposito & Tse (2015)
	Dynamism	Inward investment	High	+	13	31	10	14	Gruenhagen (2018)
		Connections with regional economy	High	+	23	68	14	35	Ratten, Alvarez-Garcia & Rio-Rama (2020); Walsh & Winsor (2019)
		Business cooperation (inter)	High*	+/-	13	19	4	5	Wheeler, McKague, Thomson, Davies, Medalye & Prada (2005)
		Business cooperation (Intra)	High	+	20	61	13	31	Harima, Harima, & Freiling (2020)
		Diverse economic structure and livelihood strategies	High	+	19	53	13	29	Cooke (2016)
		Openness to micro enterprises and micro-finance services, entrepreneurialism	High	+	22	84	15	42	Lorne (2020)
		Public-private partnership	High	+	12	36	9	24	Russell, Huhtamäki, Still, Rubens & Basole (2015)
		Private investment	High	+	10	16	10	23	Pierrakis & Saridakis (2017)
		Locally owned businesses and employers	High	+	18	47	10	24	Bakas, Duxbury & de Castro (2018)
Balance of local labour market supply and demand	High	+	14	23	8	15	Audretsch & Belitski (2017)		

Table 8-7 Innovation ecosystem contribution to community resilience - Built environment/Infrastructure dimension)

Dimension	Subdimension	Criteria	Expected contribution prior to interviews		Research results				Support from existing literature
			Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	
Built environment / Infrastructure	Robustness and redundancy	Redundancy of critical infrastructure - facilities, stocks, ecosystem	Low	+	1	1	0	0	Gallagher & Ehlam (2019)
		Spatial distribution of critical infrastructure (measure against cascading effects)	Moderate	+	0	0	0	0	Sorenson (2017); Stuart & Sorenson (2003); Autio, Nambisan, Thomas & Wright (2017)
		Location of critical infrastructure and facilities	Low	+	1	1	0	0	Gallagher & Ehlam (2019)
		Collaboration between utility providers	Moderate	+					
		Multi-functionality of spaces and facilities	Moderate	+	12	32	6	13	Gallagher & Ehlam (2019)
	Efficiency	Promotion of efficient infrastructure	Moderate	+	3	7	4	4	Gallagher & Ehlam (2019)
	ICT	Diverse and reliable information and communication technology (ICT) networks	High	+	2	2	1	3	Audretsch & Belitski (2017)
	Land use and urban design	Accessibility of basic needs and services over time (education)	Low	+	2	2	0	0	Audretsch & Belitski (2017)
		Public spaces and communal facilities	Low	+	15	44	6	20	Gallagher & Ehlam (2019)
	Transport	Capacity, safety, reliability, interestedness (connectivity) and efficiency of transportation	None	NA	1	1	2	2	Audretsch & Belitski (2017); Glaeser, Ponzetto & Tobia (2014)
		Inclusive and multi-modal transport networks and facilities	None	NA	1	1	0	0	Audretsch & Belitski (2017); Glaeser, Ponzetto & Tobia (2014)

Table 8-8 Innovation ecosystem contribution to community resilience - Institutional dimension)

Dimension	Subdimension	Criteria	Expected contribution prior to interviews		Research results				Support from existing literature
			Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	
Institutional	Leadership and participation	Strong leadership	High	+	23	76	17	46	Porras-Paez & Schmutzler (2019)
		Stability of leadership and political stability	High	+	9	22	13	46	Okrah & Hajduk-Stelmachowicz (2020)
		Shared, updated, and integrated planning vision (long term)	High	+	13	30	14	35	Zahra & Nambisan, (2012)
		Transparency, accountability, corruption, etc	High*	+/-	2	3	6	16	Ceresia & Mendola (2019); Snow & Prater (2018)
		Multi-stakeholder planning and decision making	High	+	7	13	16	46	Russell, Huhtamäki, Still, Rubens & Basole (2015)
		Decentralised responsibilities and resources	High	+	5	7	13	23	Lobo, Velez & Puerto (2016)
	Management of resources	Efficient management of resources (funds, staff, etc)	High*	+/-	7	9	14	47	Snow & Prater (2018); Roundy & Fayard (2020)
		Skilled personnel	High	+	22	65	15	35	Snow & Prater (2018); Roundy & Fayard (2020)
		Redundant capacity in terms of personnel	High	+	4	7	6	19	Roundy & Fayard (2020)
	Contingency, emergency, and recovery planning	Integration of risk reduction and resilience into development plans and policies	High	+	8	14	9	14	Steiner & Atterton, 2015
		Understanding risk patterns and trends	Moderate	+	22	62	5	13	Steiner & Atterton, 2015
	Collaboration	Cross-sector collaboration (alignment of aims) and partnership among organisations	High	+	21	54	17	45	Russell, Huhtamäki, Still, Rubens & Basole (2015)
		MOUs and MOAs with neighbouring communities and agencies within the broader region	High	+	10	20	12	21	Russell, Huhtamäki, Still, Rubens & Basole (2015); Colombelli, Paolucci & Ughetto (2019); Cunningham, Menter & Wirsching (2019)
		Knowledge and information transfer and best practice sharing (inter and intra city)	High	+	27	110	21	52	Bischoff, Volkmann & Audretsch (2018); Öberg & Alexander (2019)
	R&D	Innovation and technology update	High	+	14	48	4	11	Caiazza, Belitski & Audretsch (2019)
		Research (funds, facilities) on risks and academy-society collaborations	High	+	9	22	7	12	Öberg & Alexander (2019)
Education and training	Education (from elementary or secondary school, training, communication)	High	+	12	19	2	3	Bublitz, Chaplin, Peracchio, Cermin et al. (2020)	
	Capacity building and enhancing awareness, dissemination of statistical data, and assessment results	High	+	27	115	20	63	Bischoff, Volkmann & Audretsch (2018)	

			Expected contribution prior to interviews		Research results				
Dimension	Subdimension	Criteria	Expected innovation ecosystem contribution	Enabler or inhibitor	Roles enabling	Code instances enabling	Roles inhibiting	Code instances inhibiting	Support from existing literature
		Incentives for encouraging mitigation and adaptation (including self-mobilising, self-organisation, etc.)	High	+	8	16	2	2	Guerrero, Liñán & Cáceres-Carrasco (2020)

8.4.1 This research supports prior findings that the innovation ecosystem contributes to community resilience. This research considered the contribution of the innovation ecosystem from a systems theory perspective using roles, the functions of the roles, and the relationships as roles interact through functions to contribute towards community resilience. This lens provides an opportunity for observations to be made when considering the results from this research and depth of prior research. Six observations are made below, with suggestions based on the observations discussed in a consolidated conceptual model in Section 8.5. Observation 1: Roles have both an enabling and inhibiting contribution to community resilience

The first observation is that roles have both an enabling and inhibiting contribution to community resilience. Local government provides an enabling contribution of advocacy and influence for the institutional indicator of leadership (Mazzucato, 2018), but can also inhibit community resilience through bureaucracy, corruption and lack of trust (Ceresia & Mendola, 2019; Snow & Prater, 2018). Innovation hubs support entrepreneur outcomes (Breivik-Meyer et al., 2019), but also impact personal savings from a financially challenging business model (Kovács & Zoltán, 2017). Large corporations and established businesses sponsor innovation ecosystem activities but also inhibit collaboration through bureaucracy and institutional silos (Audretsch & Belitski, 2017).

The innovation ecosystem overall can have an inhibiting contribution on the community resilience for communities outside an ecosystem's geographic boundaries. Metro ecosystems draw resources from regional communities which can experience a lack of firm success rates, lack of networking, lower mentorship and peer to peer collaboration, and the absence of a market (Walsh & Winsor, 2019). Even within an innovation ecosystem's regional scope, the contribution can create both significant wealth for some and systemic inequality for many (Lee & Rodriguez-Poze, 2013). While conditions of significant inequality were not observed from interviews, interviewees identified contributing factors to inequality in innovation ecosystems, including trust, embeddedness, and networking isolated to resource corporations; the tendency for the nation-state to favour centralised regional development; and limited government funding to cover vast peripheries" (Martinus, 2018, p10).

The interviewee observations of enabling and inhibiting contributions highlights an inherent normative bias in the innovation ecosystem. When innovation ecosystems are supported by public funding and media attention, there is an implied value judgement that the innovation

ecosystem is ‘good’ and enabling. Interviewees in local government roles described government-owned innovation hubs in terms of enabling economic diversification whereas a local coworking space or member-based chamber of commerce highlighted inhibiting bureaucracy and displacement of existing programs.

Significant investments into innovation activity by governments can result in overstating benefits and overlooking failure of innovation ecosystem implementations (Uyarra & Flanagan, 2010). The findings from this research reflect inhibiting contributions reflected in other settings described in literature of a “shotgun approach spending millions of dollars on disparate activities without a significant impact”, “people seeking ‘free money’ to line their own pockets at the expense of progress”, and “government leaders misusing and embezzling funds” (Snow & Prater, 2018, 83). These sentiments were reflected in this research in descriptions of government programs that were described as “doing more harm than good” and local government corruption impacting the operations of a regional innovation hub.

8.4.2 Observation 2: Role functions are interchangeable

A second observation is that functions are interchangeable between roles. Interviewees shared how the entrepreneurial journey was supported by multiple roles, such as government innovation award programs, hackathons in innovation hubs, *ad hoc* meetings in coworking spaces, and service providers specialising in emerging business models. Literature also reflects various roles contributing to business creation such as hackathons (Irani, 2015) and accelerators (Hausberg & Korreck, 2020), as well as traditional models such as chambers of commerce (Chang, Jack & Webster, 2016). Functions such as advocacy and influence can be found in SMEs, established businesses, government, universities, and the entrepreneurs themselves (Cowell, Lyon-Hill & Tate, 2018).

As identified in Section 5.3, the interchangeability created opportunities for collaboration and competition. Roles attempting to secure revenue from scarce local sources contributed to roles operating in silos. Functions could be limited to a single role, and roles actively worked to prevent other roles entering the community that may compete over scarce resources. While this would limit competing interests between roles, it also meant there was limited redundancy, a lack of specialist skills, and a lack of diversity which has been identified as inhibiting resilience in regional economies (Martin & Sunley, 2015; Huggins & Thompson, 2015).

8.4.3 Observation 3: There can be a central coordination role in the innovation ecosystem

A third observation is the presence or lack of a central coordination role in the innovation ecosystem. Interviewees reported a lack of clear accountability and transparency in roles providing ecosystem support services, organisations working in silos, and competitive tensions between roles providing similar services. Emerging organisational structures such as entrepreneur support advocacy bodies were noted as addressing these challenges along with ecosystem leaders who acted as a central point to facilitate collaboration. These coordination efforts frequently focused on addressing common and agreed challenges through structured programs integrated with different role's operational activities.

Similar emergent structures are identified in literature, where collective structures exhibit characteristics of accountability and transparency, legitimacy, equality policies, a participatory organisational structure, social innovation and entrepreneurial orientation to provide governance in the innovation ecosystem (Vázquez-Maguirre, 2018). A collective impact or collective action framework is an example of one such approach to address challenges in innovation ecosystems of a lack of basic managerial and operational skills among community leaders, a lack of agreed central leadership, and bottlenecks from decisions made by consensus (Lobo, Vélez & Puerto, 2016). A structure observed in this research was the 'Entrepreneur advocacy, education organisations' and was often a loosely formed group that in the absence of formal structure often lacked legitimacy in relation to roles in the community. This is reflective of literature on collective impact models and in particular the emergence of what are referred to as backbone organisations (DuBow, Hug, Serafini & Litzler, 2018; Christens & Inzeo, 2015).

Backbone structures are an example of collaborative structure similar to other collaborative roles of hybrid interorganisational partnerships, integrative public leadership, 'shared leadership', or 'community-based leadership' and is an emerging role in the innovation ecosystem. The primary activities of a backbone structure are to: (1) guide vision and strategy; (2) support aligned activities; (3) establish shared measurement practices; (4) build public will; (5) advance policy; and (6) mobilize funding (Hanleybrown, Kania, & Kramer, 2012). As highlighted in Chapter 4, the innovation ecosystem in Queensland experienced rapid, recent expansion of individual actors and roles. It is not surprising that new roles emerge to address increased awareness of inhibiting factors related to a lack of coordination.

The emphasis and execution of these activities evolve over time as the role matures (Selin, 2017; DuBow et al., 2018). In a municipality in Italy, a similar organisation structure of a Regional Innovation Office (RIO) was formed by a collaborative approach between one municipality, one public university, three trade and industrial associations, one Chamber of Commerce, a Public Utility Company, and a Regional European Development Office (Ungureanu & Macri, 2018). After the first five years, the RIO experienced challenges including a lack of focus on collective goals, decision made in hierarchical silos, lack of perceived value, opportunistic behaviour, lack of entrepreneur focus, lack of investment funding, and lack of information. Following a year and a half transition, the RIO was restructured to minimise competing interests, widening participation, concentrate governance, focus on specific challenges integrated with role operations, and create reporting, communication, and information structures.

The rapid growth of the Queensland innovation ecosystem created new roles. Interviewees reflected on ambiguity of functions performed in communities and competitive tensions between roles. Reflecting on what is found in literature, the lack of coordination created increased transaction costs for the entrepreneurs and innovative businesses in the community (Roundy & Fayard, 2020). New collaborative roles were emerging to address these challenges. While interviewees reflected on many of the inhibiting factors evident in similar situations from literature, descriptions of the evolution of similar structures over time provide promise for the potential for additional enabling functions as the structures mature.

8.4.4 Observation 4: Role contributions are contextual based on ecosystem maturity, geography, and periphery group

A fourth observation is that contributions are contextual based on ecosystem maturity, geography, and periphery. What may be inhibiting in one situation may be enabling in another. Research is clear on how the contribution of roles in an innovation ecosystem change over the lifecycle of an ecosystem (Dedehayir et al., 2016; Mack & Mayer, 2016; Auerswald & Dani, 2017; Xu & Dobson, 2019), across geographic regions (Cooke, 2016; Global Entrepreneurship Monitor, 2020, Startup Genome, 2018; Kantis, Federico & Garcia, 2020), and periphery group outside the core such as those based on gender Kuschel et al. 2020, Díaz-García et al. 2013; Settles et al. 200 (Kuschel et al. 2020, Díaz-García et al. 2013; Settles et al. 200), age (Atherton, Wu & Wu, 2018; Maritz & Eager, 2017; Perenyi, Zolin & Maritz, 2017), or cultural heritage (Wood & Davidson, 2011; Maritz & Foley, 2018).

Narratives from interviewees included descriptions of increased government funding enabling an early-stage innovation ecosystem but resulting in inhibiting ‘funding centralisation’ and preventing other roles participating in later stages of a local ecosystem. A role such as a local government may see the introduction of additional coworking spaces as an enabler while other existing coworking spaces would see it as an inhibiting factor of ‘competing interest’ preventing growth of roles to provide diversity and redundancy. Accelerator programs from more mature ecosystems relaxed requirements for an exclusive technology focus to accommodate entrepreneurs in regional communities.

The Queensland innovation ecosystem is relatively early in maturity. Many of the actors in the innovation ecosystem are less than five years old and many actors are the first example of the role for the region. Many communities are experiencing their first innovation hub, accelerator program, hackathon, or coworking space. Many functions are being performed for the first time, such as government creating an innovation hub or a local established business sponsoring an innovation event. The stage of the local innovation ecosystem can be overlooked when considering the complexity of the task and length of time required for an ecosystem to mature.

The maturity process of an entrepreneurial ecosystem is argued to take decades (Neck, Meyer, Cohen & Corbett; Mason & Brown, 2014; Mack & Mayer, 2016). In addition to time, entrepreneur ecosystems require a density of new enterprises to realise outcomes of increased number of companies, jobs, and economic diversification (Fritsch & Wyrwich, 2019). In addition to the ecosystem maturity and geography, interviewees identified additional barriers based on gender, age, and cultural heritage including indigenous. An innovation hub’s third space may be welcoming for a heterogenous group and inhibiting for those who may feel excluded. Events and hackathons may inhibit engagement for females who statistically are more likely to be child carers in single-parent situations. The application of services in emerging regional communities needs to take these factors into account when managing expectations and prescribing services (Xu & Dobson, 2019).

8.4.5 Observation 5: Role contributions are interrelated and have a cross-dimensional impact

A fifth observation is that role contributions are interrelated and have a cross-dimensional impact. Research reflects the integration of ecosystem framework conditions (Audretsch & Belitski, 2017; Spigel & Harrison, 2015; Isenberg, 2011; Feld, 2012). Enabling factors of ‘funding’ (economic) and ‘strong top vision’ (institutional) are needed to address the inhibiting

factor of ‘poor internet connectivity’ (built environment / infrastructure). The enabling factor of ‘availability of angel funding’ related to the economic dimension can address the ‘funding centralisation’ inhibiting factor attributed to the institutional dimension. Interventions need to consider the interrelated nature of contributions, as demonstrated by three examples of broad ecosystem strategies in Table 8-9.

Table 8-9 Strategies for innovation ecosystem development

Principles of ecosystem building (Biggs et al., 2012)	The Startup Community Way (Feld & Hathaway, 2012)
<ul style="list-style-type: none"> • Maintain diversity and redundancy • Manage connectivity • Manage slow variables and feedbacks • Foster an understanding of social-ecosystem services as complex adaptive systems • Encourage learning and experimentation • Broaden participation • Promote polycentric governance systems 	<ul style="list-style-type: none"> • Entrepreneurs must lead the startup community. • The leaders must have a long-term commitment. • Startup communities are complex adaptive systems that emerge from the interaction of the participants. • Startup communities can be guided and influenced, but not controlled. • Each startup community is unique and cannot be replicated. • Startup communities are organized through networks of trust, not hierarchies. • The startup community must be inclusive of anyone who wants to participate. • Openness, support, and collaboration are critical behaviours in a startup community. • The startup community must have continual activities that meaningfully engage the entire entrepreneurial stack. • Startup communities must avoid the trap of letting demand for measurement drive flawed strategies. • Putting founders first, giving before you get, and having an intense love of place are essential values in a startup community. • Startup communities are propelled by entrepreneurial success and the recycling of those resources back into the next generation. • The best startup communities are interconnected with other startup communities. • The primary purpose of a startup community is to help entrepreneurs succeed.
Rules of the Rainforest (Hwang & Horowitz, 2012)	
<ul style="list-style-type: none"> • Break rules and dream • Open doors and listen • Trust and be trusted • Seek fairness not advantage • Experiment and iterate together • Err, fail and persist • Pay it forward 	

Acknowledging the different focal points (ecosystem services, startup ecosystem, innovation ecosystem), the principles, rules, and strategies in Table 8-9 provide a further framework to group factors. For example, reinforcing Feld’s principle that “Startup communities are organized through networks of trust, not hierarchies.” would align with enabling factors of ‘personal relationship and trust’ and ‘collaborative leadership’ and be contrary to inhibiting factors of ‘bureaucracy’ and ‘lack of trust’. This can be further expanded through literature on enabling trust (Muldoon et al., 2020) and inhibiting corruption (Ceresia & Mendola, 2019). Brigg’s principle to “promote polycentric governance systems” would align with the enabling factor of ‘distributed leadership’ and be contrary to the inhibiting factor of ‘lack of governance’. Further literature can be applied that focuses on governance systems in innovation

ecosystems (Cumming et al., 2019; Colombelli et al., 2019). Further correlation can be made to align broad strategies to individual community resilience indicators and role contributions.

8.4.6 Observation 6: Current inhibiting contributions may result in future resilience

Finally, what can be perceived by a role as inhibiting contributions in the current context may eventually result in future community resilience. The innovation ecosystem is complex. A linear causality between factors and outcomes should not be assumed (Roundy et al., 2018). What was expressed by an interviewee as an enabling contribution could be viewed by another as inhibiting over time. The failure of a local government innovation hub was seen as an opportunity for other private investment models that had previously struggled with what was seen as subsidised competition. The failure of a startup company provided experience for the entrepreneur to start a new company or develop capability as an ecosystem leader to support other entrepreneurs. Perceived operational integration and collaboration by government can be reflected as silos and bureaucracy by a local education provider not involved in the program.

Responses from interviewees reflect a perspective at a point in time. It may be that the contribution to community resilience to “continuous social and economic pressures resulting from technology and market change” as outlined in Section 4.3 can only be developed through experiencing contributions that may be perceived as inhibiting. In the case of one community, corruption of a local government prompted increased Australia-first policies in transparency and communication in subsequent years. In another situation, increased support for entrepreneur activities and increased collaboration only came about as a result of leadership burnout in the local ecosystem leader. It is not possible to predict whether these outcomes would have been achieved if not for the sustained and acute presence of the inhibiting contributions in the community.

8.5 The role of the innovation hub in building community resilience (RQ3)

RQ3 focused the inquiry of contributions to community resilience on the role of the innovation hub. The emphasis on the innovation hub provided an opportunity to examine how and whether one element reflects the characteristics of the overall system. The discussion that follows explores how the observations made in Section 8.4 on the contribution of the innovation ecosystem apply to the innovation hub (Figure 8-3).

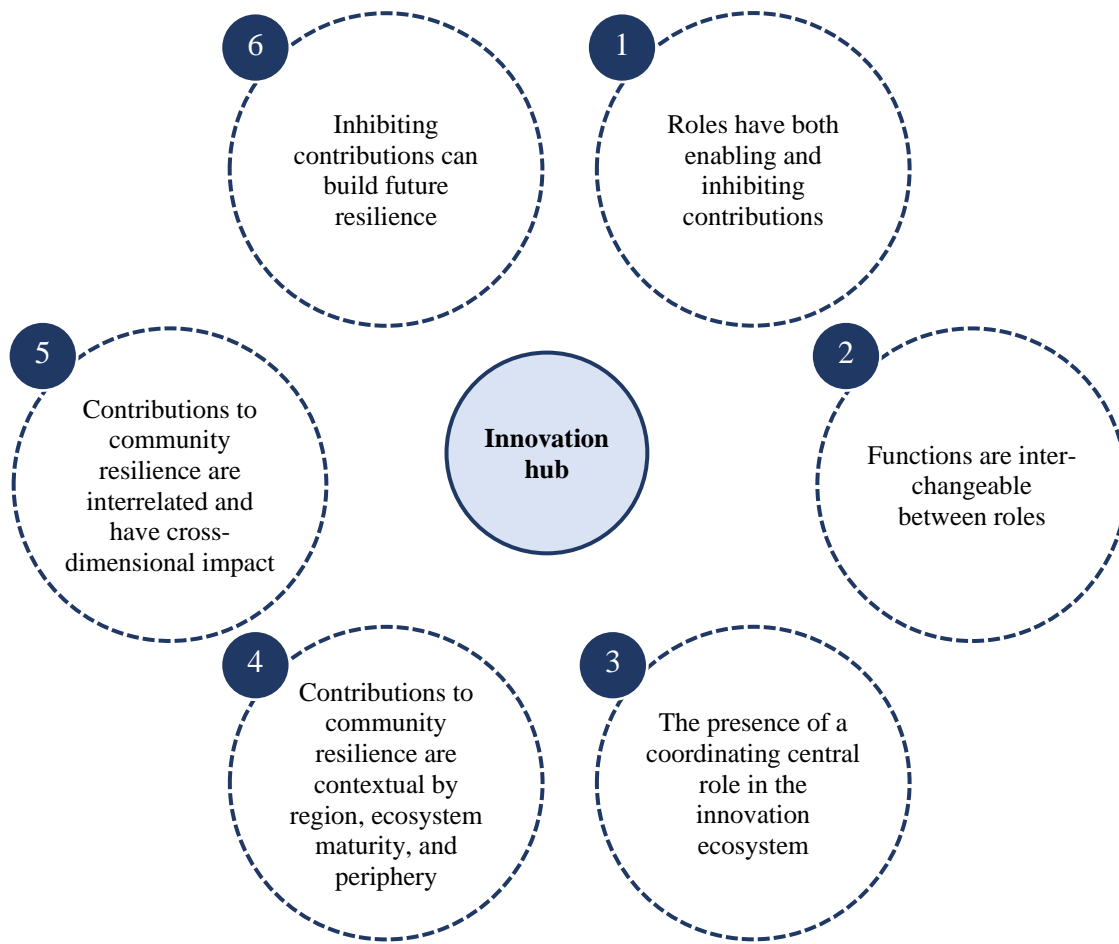


Figure 8-3 Six observations of the innovation hub contribution to community resilience

8.5.1 Observation 1: Innovation hubs have both an enabling and inhibiting contribution to community resilience

First, the aggregated results in Figure 8-4 demonstrate that the contribution of the innovation hub is both enabling and inhibiting towards the four dimensions of community resilience. The innovation hub acted as an enabling ‘third space’ and ‘used existing assets’ but also promoted inhibiting factors of ‘competing interests’, ‘constraints from space owners’, and ‘lack of diversity’ for the Built environment/infrastructure dimension. The innovation hub demonstrated enabling factors of ‘additional support for early-stage founders’, facilitated ‘availability of local angel funding’, and ‘collaboration in providers and programs’, but also exhibited inhibiting factors of ‘lack of reporting’, ‘lack of specialist focus’, ‘lack of sustainable business model’ for the Economic dimension.

For the Social and individual dimension of community resilience, the innovation hub provided ‘boundary spanning programs’, involved ‘community in programs’, facilitated ‘cross promotion’ with other roles, and represented ‘diversity in leadership capability’. However, the

innovation hub also inhibited the dimension through an ‘emphasis on high-growth firms’, use of ‘exclusive language’, and influenced a ‘lack of capacity in ecosystem leaders’ who engaged in a ‘focus on others at the expense of self’. Finally, the Institutional dimension also had mixed contributions of enabling ‘resources sharing’, ‘structured programs’, ‘events’, and ‘distributed capability’ as well as inhibiting ‘fragmented approach’, ‘dependent on the individual’, ‘lack of communication’, ‘lack of data’, and ‘leader burnout’. Similar findings are identified in literature.

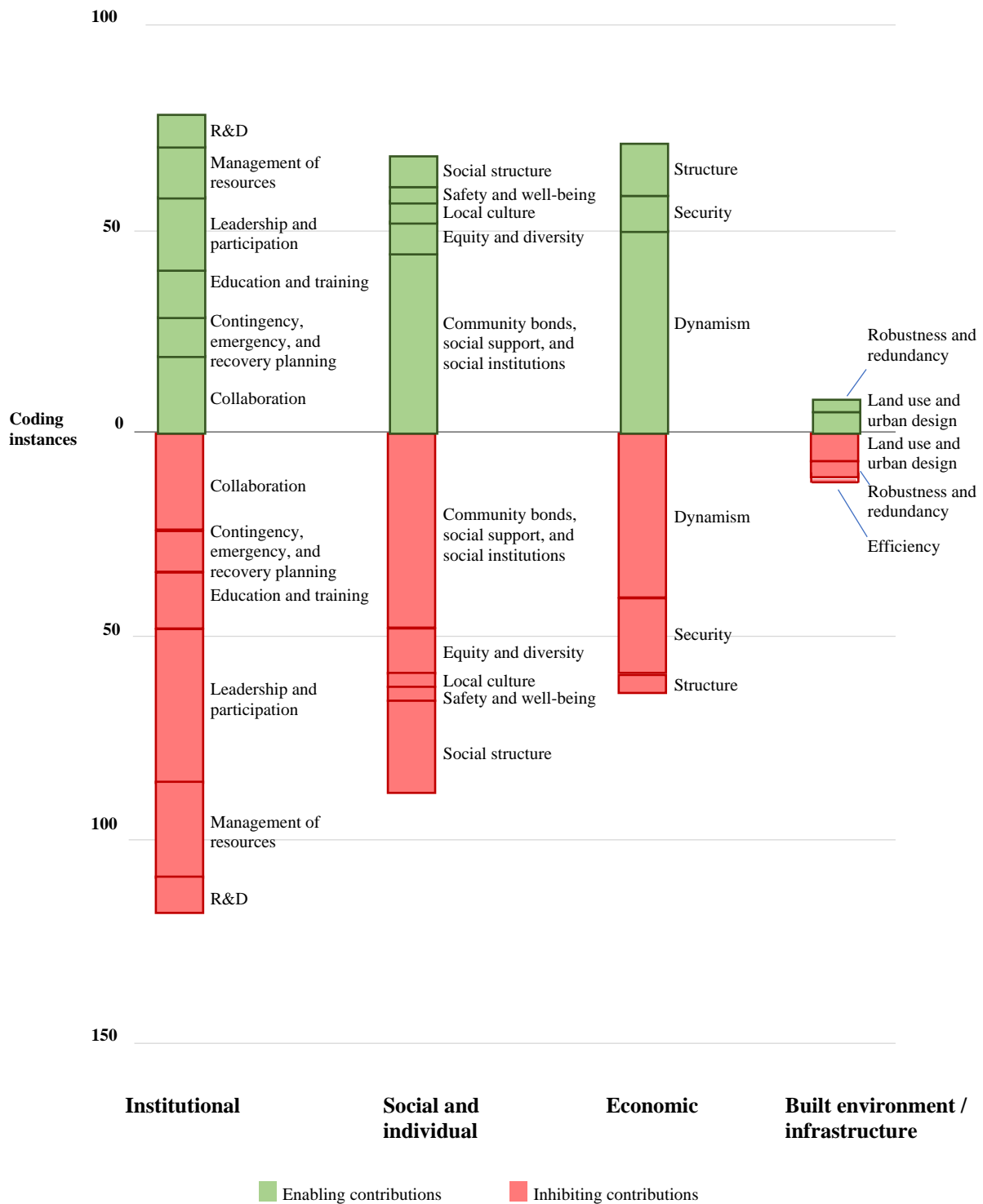


Figure 8-4 Enabling and inhibiting contributions of the innovation hub to community resilience, by subdimension

These findings are reflected in literature. Innovation hubs offer a form of organisational sponsorship, providing collaboration and connectedness for emerging businesses (Haines, 2016; Spinuzzi, Bodrozic, Scaratti & Ivaldi, 2019; Bouncken, Laudien, Fredrish, & Gormar, 2018). These services also have an inhibiting contribution to communities through risk alienating incumbents through use of exclusive language (Kuratko, Fisher, Bloodgood, &

Hornsby 2017), challenges from introducing financially challenged business models (Seo et al., 2017), and creating opportunities for corruption and other roles to take advantage of unsuspecting entrepreneurs through misallocated trust (Ungureanu & Macri, 2018).

The normative bias noted in the innovation ecosystem discussion in Section 8.4.1 was particularly evident in the narratives regarding the innovation hub. Innovations hubs required significant capital investment. In each instance hubs were heavily subsidised by the owning entity of government, university, or corporation, and/or largely volunteer supported with limited if any profit. The innovation hubs and their supporters had a vested interest in emphasising the benefits of the innovation hub while incumbents in the region and roles with competing functions such as chambers of commerce viewed the hub activities with scepticism. With limited empirical measurement, the perceived value of the innovation hub depended on the capacity, ability, and influence of hub proponents to share outcomes. These two perspectives can be seen broadly in critical reviews that emphasise inhibitors of ecosystem activity (Snow & Prater, 2018; Walsh & Winsor, 2018) and reviews supporting innovation hub activity (Haines, 2016; van Weele, 2018).

8.5.2 Observation 2: Innovation hub functions are interchangeable with other roles

Most of the innovation hub's functions are shared by other roles involved in organisational sponsorship services (Amezcuca et al., 2013) as described in Section 5.4. Other roles provide physical space, support for entrepreneurs, promotion of entrepreneur and innovation outcomes, mentoring, and support for collaboration. Within the hub and across roles, there was evidence of 'coopetition' as roles both shared and competed on common functions and services (Bouncken, Laudien, Fredrish, & Gormar, 2018). However, the innovation hub is unique in providing the combined configuration of all the services. While each of these functions were associated with enabling contributions, other roles shared about a lack of perceived value on the combined value.

Integrating the results from RQ1 in Chapter 5 and RQ3 in Chapter 7 identifies further opportunities for collaboration with other roles on dimensions of community resilience (Figure 8-5). Enabling contributions to the economic dimensions of community resilience that relate to core functions of the innovation hub include 'providing additional support for early-stage founders', 'providing a dedicated third space', 'engaging established businesses', 'integrating programs with other roles', and 'having a specialist focus'. Core functions of the innovation hub identified as inhibiting the economic dimensions of community resilience include 'high

cost of startup support’, ‘an over-emphasis of high growth firms’, ‘use of exclusive language’, ‘a lack of program follow-through’, and ‘local competition’. Being aware of the interchangeability of roles provides opportunities to collaborate with other roles in the innovation ecosystem to enhance enabling contributions and reduce inhibiting contributions.

Similar opportunities are available for internal functions. For example, identifying other roles that share the enabling contribution of ‘local leader community focus’ or work to identify and address the inhibiting contribution of ‘bureaucracy’ for the Social and individual dimension of community resilience. The results also highlight contributions where the innovation hub may only have external concern but still be aware of supporting other roles, such as addressing the inhibitor of ‘fear of political risk’ when engaging government for funding or collaborating with universities to support the infrastructure dimension enabling contribution of ‘research and data’.

Innovation hub functions				Community resilience dimensions				Enabling contributing factors to community resilience	Inhibiting contributing factors to community resilience	Community resilience dimensions				Innovation hub functions			
Core	Internal	External influence	External concern	Built environment / Infrastructure	Institutional	Social and individual	Economic			Built environment / Infrastructure	Institutional	Social and individual	Economic	Core	Internal	External influence	External concern
X								Accessible	Advocacy effort							X	
X								Additional support for early stage founders	Attributing past failure to new models							X	
		X						Advocacy	Australian independent culture							X	
		X						Availability of local angel funding	Bureaucracy						X		
	X							Available resources	Competing interests							X	
		X						Award programs	Constraints from space owners					X			
X								Awards	Corruption							X	
X								Boundary-spanning programs	Cost of startup support					X			
	X							Clear accountabilities and responsibilities	Dependant on the individual						X		
		X						Collaboration in providers and programs	Disruption to young people							X	
		X						Collaborative agreements	Emerging roles					X			
		X						Collaborative leadership	Emphasis on high growth firms					X			
		X						Collaborative programs	Exclusive language					X			
		X						Community in programs	Fear of political risk							X	
X								Consistency	Focus on others at expense of self					X			
	X							Cross-promotion	Fragmented approach				X				
		X						Dedicated leaders	Funding centralisation							X	
		X						Dedicated media	High speed internet costs							X	
X								Dedicated third space	IP constraints							X	
	X							Distributed capability	Lack of access to talent							X	
		X						Distributed funding	Lack of awareness or understanding							X	
	X							Distributed leadership	Lack of capability							X	
	X							Diverse leadership capability	Lack of capacity in ecosystem leaders							X	
X								Diversity of spaces	Lack of common challenge					X			
X								Engage established businesses	Lack of communication					X			
X								Events	Lack of data							X	
X								Flexibility	Lack of diversity					X			
X								Focus on fewer, higher quality initiatives	Lack of funding							X	
X								Focused programs	Lack of governance					X			
	X							Funding	Lack of leadership and direction							X	
	X							Generational leadership	Lack of legitimacy							X	
X								Hackathons	Lack of local advocacy							X	
	X							Incumbent leadership	Lack of local collaboration							X	
	X							Influence	Lack of local government role							X	
	X							Innovation-driven corporations	Lack of motivation in Australian culture							X	
X								Integrated programs	Lack of perceived value							X	
	X							Intermediary role between cultures	Lack of permanency					X			
	X							Leadership capability building	Lack of priority					X			
	X							Local leader community focus	Lack of program follow-through					X			
	X							Media and promotion	Lack of redundancy							X	
X								Mentoring	Lack of reporting							X	
X								Momentum	Lack of research and data							X	
	X							Multiple points of leadership	Lack of resources					X			
X								New projects	Lack of security					X			
	X							Operational integration	Lack of service provider curation / availability							X	
X								Personal relationship and trust	Lack of specialist focus					X			
X								Personal relationships with leaders	Lack of startup focus					X			
		X						Proximity	Lack of sustainable business model							X	
		X						Research and data	Lack of transparency							X	
		X						Resource sharing	Lack of trust							X	
		X						Senior leadership and advocacy	Corruption							X	
		X						Shared challenge focus	Leader burnout					X			
X								Social sharing	Local competition					X			
X								Specialist focus	Low number of specialist skills							X	
X								Strong top vision	Low perception of value							X	
X								Structured programs	Operating in silos					X			
		X						Support for local community leaders	Poor internet connectivity							X	
	X							Surrounding retail	Remoteness							X	
X								Third space	Resource intensive support					X			
X								Use existing assets	Role conflict							X	
									School engagement							X	
									Systemic social barriers							X	

Figure 8-5 Summary of innovation ecosystem contributing factors of community resilience mapped to functions of the innovation hub

8.5.3 Observation 3: The innovation hub vs. a central coordination role in the innovation ecosystem

Innovation hubs provided functions related to a central coordinating role in the ecosystem, at times displacing established entrepreneur advocacy roles. Many innovation hub managers saw the function of a central coordinating role as a natural and necessary function to support entrepreneurs given the value that a coordinating role has in reducing entrepreneur transactional cost in a local innovation ecosystem (Roundy & Fayard, 2020). However, innovation hubs were also not resourced to deliver coordination functions. There could also be a conflict of interest in the hub acting a central coordinating role considering the core innovation hub functions shared by other roles. These conflicts are reflected in literature as ‘agency challenges’ that are more likely to occur in a flat, open and informal context: conflicts of interest between entrepreneurs and the owners of the innovation hub, opportunistic behaviours within the hub, and resistance to measurement and controls (Longo & Giaccone, 2018).

8.5.4 Observation 4: Innovation hub contributions are contextual based on ecosystem maturity, geography, and periphery group

The contribution of the innovation hub on community resilience varied by region and the actor’s experience, perception, structure, and relationship with the hub, and view of the maturity of the local innovation ecosystem. The inhibiting factors of ‘bureaucracy’ and ‘operating in silos’ were attributed to innovation hubs owned by local government or university but not by innovation hubs owned by private individuals. However, innovation hubs owned by private individuals could be associated with inhibiting factors of ‘leader burnout’ and ‘lack of local government role’. Entrepreneurs who were members of an innovation hub identified enabling factors of ‘mentoring’ and ‘personal relationships and trust’, while entrepreneurs outside the hub expressed inhibiting factors of ‘lack of trust’ and ‘lack of diversity’. A local government that owned an innovation hub identified enabling factors of ‘momentum’ and ‘specialist focus’ while a local chamber of commerce expressed inhibiting factors of ‘attributing past failure to new models’, ‘lack of awareness and understanding’, and ‘lack of legitimacy’.

The innovation hubs in regions interviewed for this research operated in ecosystems that were all at an early stage of maturity. The hubs themselves were established within the past five years and managed by leaders whose experience was limited to the one innovation hub. Yet the innovation hubs were modelled from examples from more mature ecosystems even as

guidance on hub management from literature specific to innovation hubs was limited, emerging, or from a different geographic context (LaunchVic, 2017; Haines, 2016; Marques, Yigitcanlar & de Costa, 2015; Barrow, 2001).

The geographic region also contributed to opportunities to collaborate and develop focus areas for specialisation based on technology, community groups, or industry specialisation. A specialisation focus has been found to benefit the incubator, the entrepreneurs, and the overall network through increased quality of the networks and availability of resources (Schwartz & Hornych, 2010). While specialisation was in some cases deemed as desirable and curation was seen as adding value to the innovation hub's position, other interviewees were reticent to emphasise a focus area at the exclusion of potential entrepreneurs and limit curation. It could be expected that there will be a greater emphasis on specialisation over time given the early-stage maturity of the ecosystems when the interviews were conducted and the variance in perspectives on specialisation.

8.5.5 Observation 5: Innovation hub contributions are interrelated and have a cross-dimensional impact

The innovation hub contributed to multiple dimensions of community resilience. Roles external to the hub such as chamber of commerce or local government identified more with enablers in the economic dimension of community resilience, emphasising economic diversification and a desire to create employment and attract new forms of work. The institutional, social, and individual dimensions were also identified but were not associated as much with the core functions by those not working in or with the innovation hub. In contrast, interviewees in roles directly associated with incubators including entrepreneurs and innovation hubs were more likely to acknowledge the interrelated nature of the innovation hub's contribution to community resilience. This is reflective of differing perceived priorities from different perspectives (Seo et al., 2017).

The interrelated nature of the impact of the innovation hub was not consistently understood by roles in the community. Innovation hub resources were often limited for media and promotion to create a common narrative amidst competing interests. Reporting on actual outcomes was limited given most hubs were newly established and lacked resources or capability for reporting. Innovation hub reporting focuses on either incubator performance or incubator processes and activity (Rubin, Aas & Stead, 2015; Renault, 2017). Where there is performance reporting, it is often focused on outcomes from participating entrepreneurs rather than broader

impact in the community (Torun, Peconick, Sobreiro, Kimura & Pique, 2018). Measurement of impact on the local community requires a level of sophistication not often available in the innovation hub (Lewis, Harper-Anderson & Molnar, 2011).

8.5.6 Observation 6: Current inhibiting contributions of the innovation hub may result in future resilience

The sixth observation that relates to inhibiting contributions building future resilience also applies to the innovation hub. For example, a lack of capability in an innovation hub manager was evident in internal functions of leadership development and had the potential to impact across multiple community resilience dimensions and a number of roles in the ecosystem. This was evident in some cases where roles had a lower perceived value of the hub and lack of trust based on the capability of the hub leader. However, the inhibiting contribution was a feedback mechanism for actors to make a response decision. Local governments invested in training for hub managers to build capability, hub managers invested in self-development, and local service providers volunteers to provide additional capacity and capability to the innovation hub.

To adapt psychology principles from Viktor Frankl, it is not the stimulus that determines resilience, but the response (Frankl, 2011). Resilience characteristics in individuals include optimism, the ability to reappraise and reframe negative thoughts, coping through behavioural or psychological techniques, a strong social support, and a moral compass (Wu, Feder, Cohen, Kim et al., 2013). The presence or lack of these characteristics were evident in varying degrees in interviewee narratives by and about the innovation hub.

Much of this research has focused on underlying framework conditions that indicate community resilience. Similarly, there are characteristics of an innovation hub that are more likely to contribute towards entrepreneur success but ultimately the “potential effects of incubator support depends not only on the services provided but also on the extent to which the tenants actually make use of the services” (Breivik-Meyer et al., 2019, p2). The innovation hub has the potential to both enable and inhibit community resilience, but resilience itself is determined by the community response.

8.6 A consolidated conceptual model

This research did not set out to develop a conceptual model. However, the iterative interview, coding, and corroboration process does lend itself to a structured process that allows a conceptual model to emerge from the research (Aluko, 2015). The proposed model in Figure

8-6 is informed by this research and reflects a systems perspective of the innovation ecosystem contribution on community resilience.

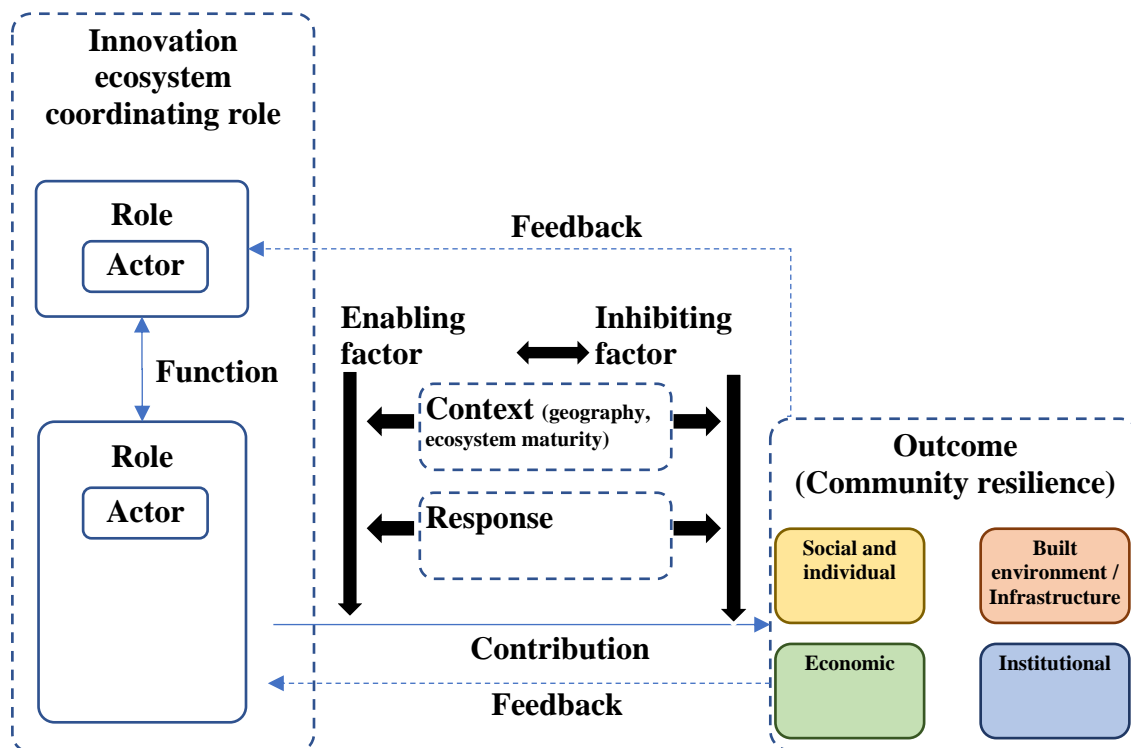


Figure 8-6 Conceptual model of the innovation ecosystem contribution to community resilience

The conceptual model attempts to describe the relationship between roles and actors as they interact through functions. An actor is associated with a role, and an actor can be associated with more than one role. A role is socially defined by the performance of its functions and, per Observation 2, role functions are interchangeable.

The interaction of roles can be supported by an ecosystem coordinating role, as noted in Observation 3. This role was missing or emerging in the ecosystems observed in this research. The presence of the coordinating role may be associated with the maturity of the ecosystem. The coordinating role also evolves and matures over time.

Community resilience is an outcome of the innovation ecosystem. Each role contributes to this outcome. Enabling factors and inhibiting factors influence this contribution, as identified in Observation 1. The influence of the enabling and inhibiting factors is moderated by the geographic and ecosystem maturity context (Observation 4) and the response of the role to the factors (Observation 6). An enabling and inhibiting factor can influence multiple dimensions and a role can contribute to multiple dimensions (Observation 6).

8.7 Conclusion

Chapter 8 presented a discussion on each of the three questions posed by this research and concludes the research thesis. Section 8.3 focused on the first research question (RQ1) relating to the role of the innovation hub in the innovation ecosystem. The roles identified in the research were compared to roles defined in literature to consider where there might be gaps and alignment. The review highlighted the ambiguity in literature and the distinct role of the innovation hub. Further opportunities to develop strategy based on an understanding of functions of the innovation hub were considered.

The second research question (RQ2) relating to the innovation ecosystem contribution to community resilience was discussed in Section 8.4. Enabling and inhibiting factors were discussed to consider how factors are influenced by multiple roles, the relationship and dependency between enabling and inhibiting factors, the connection between dimensions of community resilience, and the potential for time delays when considering factor influence on community resilience. Six observations were made about the nature of the innovation ecosystem's contribution to community resilience.

The third research question discussed in Section 8.5 (RQ3) related to the role of the innovation hub in contributing to community resilience. Following a summary review of contributions, the functions of the innovation hub were applied to the enabling and inhibiting factors. The discussion considered the six observations identified in RQ2 and how they reflected on the innovation hub.

CHAPTER 9: CONCLUSION: RESEARCH CONTRIBUTION, LIMITATIONS, AND FUTURE OPPORTUNITIES

9.1 Contribution to theory

The research draws on systems theory and contributes to multiple fields within innovation and entrepreneur ecosystem research (see Velt, Torkkeli, & Laine, 2020): a *network perspective* building on a cluster linked to Isenberg's (2010) foundational work and others who view the ecosystem as a whole and 'how' the ecosystem is conceptualised; a *complexity perspective* including concepts of emergence of roles based on needs of actors in the system (Van De Ven, 1993) and contrasting narratives as feedback in the system (Roundy, 2016); a *context perspective* applying a normative value on 'how' the ecosystem should be managed based on the institution relationship to community resilience (Bischoff, 2019; Simmons et al., 2019); a *geographic perspective* based on the emphasis on regional communities (Cavaye, 2015) as compared to more populated city centres (Audretsch and Belitski; 2017); and an *agency perspective* acknowledging the existence and contribution of roles in the ecosystem (Spigel, 2017). The research created a framework for considering the three constructs of the role of the innovation hub, the innovation ecosystem, and community resilience (Figure 8-7). By taking a systems theory perspective and breaking the system down to the component roles, the approach can be used to consider other roles apart from the innovation hub.

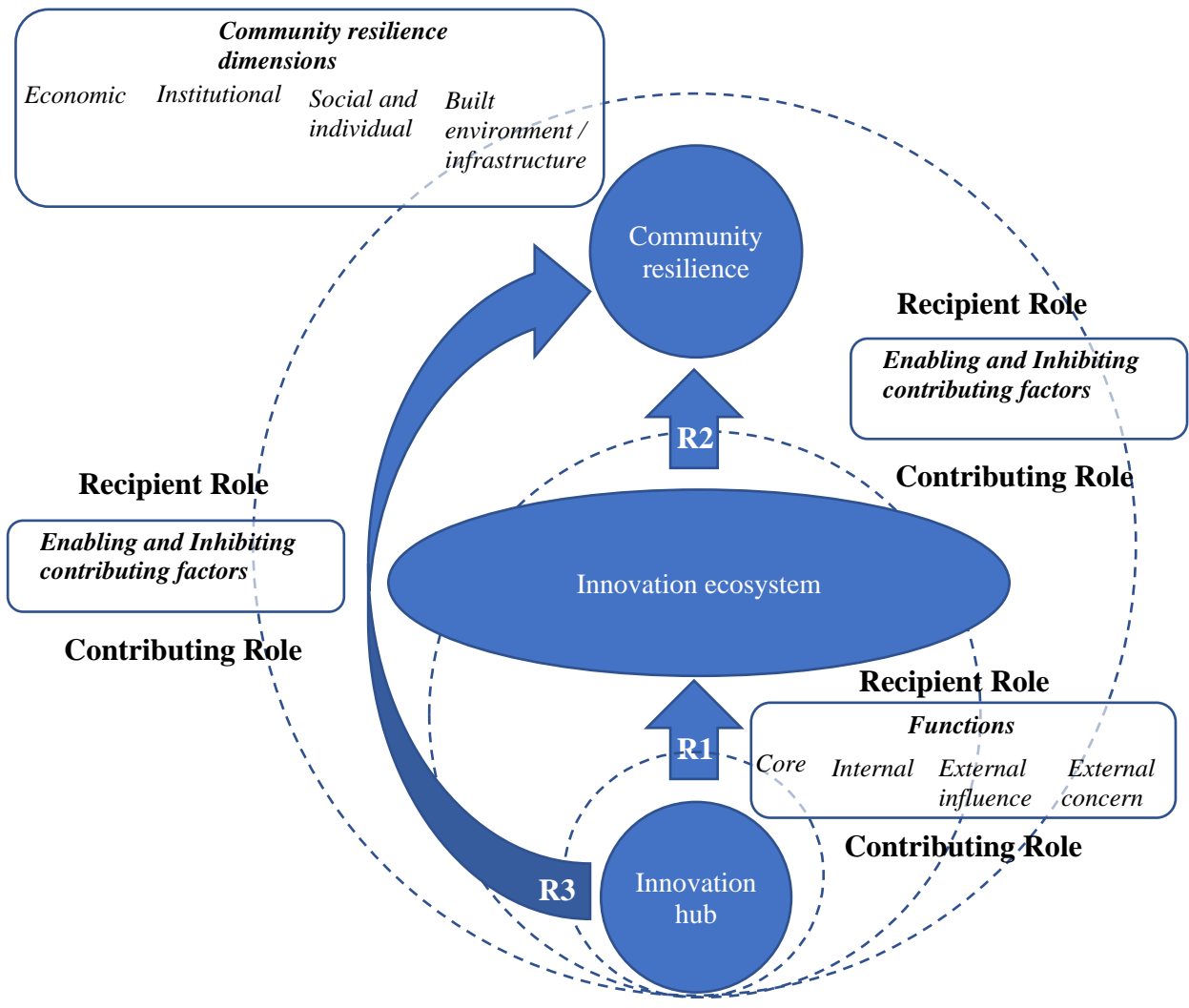


Figure 9-1 Research question outcomes

This research contributes towards the body of knowledge by addressing the ambiguity inherent in defining the innovation ecosystem. The innovation ecosystem is a complex adaptive system, constantly changing, socially constructed, and emerging (Brett, 2019). The process of conceptualising groups of functions into roles and giving names to those roles can depict a reality that does not reflect the emerging nature of the system (Demerath & Suarez, 2019). Failure to acknowledge the dynamic, networked, and systemic nature of the innovation ecosystem can lead to reductionist approaches to policy design and implementation (Acs, et al, 2015). As identified in this research, preconceived ideas about roles of ‘government’, ‘service providers’, ‘chambers of commerce’, and innovation hubs’ can influence the effectiveness and acceptance of the role by those in the innovation ecosystem.

These challenges contribute towards the ambiguity of innovation ecosystem roles. Prior research has aimed to address this ambiguity by comparing research and commercial

economies (Oh et al, 2017), reconciling conceptual umbrellas and coherent theory (Spigel, 2015) providing theoretical consistency concerning innovation ecosystem terminology (Gomes et al., 2016), addressing different ecosystems and sub-ecosystems (Meshram & Rawani, 2019), comparing an innovation system approach versus the entrepreneurial ecosystem approach (Stam, 2015), consolidating fragmented findings (Velt, Trorckeli & Laine, 2020), searching for potential divergent characteristics (Rakas & Hain, 2020), providing a better understanding of the structure of an ecosystem and its interconnected layers (Dias, de Souza Bermejo, Moreira, & de Souza, 2020), and categorising entrepreneurial ecosystem models (Maroufkhani, Wagner & Ismail, 2017). The aim of this research was not to add to this ambiguity by presenting yet another model. Rather, this research contributes to the body of knowledge by developing a transparent method based in systems theory using actor network theory and critical realism by which roles are dynamically defined and assessed by actors in the ecosystem, compared to existing innovation ecosystems, and against a growing body of literature.

The method in the research addressed the limitations of functional approaches to the innovation ecosystem noted in Section 1.3. The integration of actor network theory and critical realism provided a practical application which to date has had limited use particularly in innovation ecosystem research (Elder-Vass, 2015). It is believed this is a unique contribution to innovation ecosystem research using a combination of critical realism, actor network theory, and qualitative research using appreciative inquiry.

9.2 Contribution to policy

As set out in Section 1.2 and expanded in Section 2.5, there has been significant investment in policies related to the innovation ecosystem including the development of innovation hubs. This investment is frequently focused on broad economic diversification outcomes without understanding the specific impact that is expected. The narratives from the research highlight the lack of measurement and reporting on innovation ecosystem investments and gaps in the direct correlation of policy impact and outcomes explicitly related to broad community resilience (Bristow & Healy, 2018; Simmie, 2014).

First, enabling and inhibiting contributions can be considered when developing new policies. This research provides an understanding of roles in the innovation ecosystem, a framework to consider the functions of an innovation hub, and a means to consider the contribution of the innovation ecosystem and the innovation hub on dimensions of community resilience. If policy decisions are considered to implement new developments or changes in innovation ecosystems,

the list of enabling and inhibiting contributions can be considered to better enable community resilience. Further, policy decisions can consider the community resilience dimensions and indicators against role contributions to determine enabling and inhibiting contributions.

Second, the research can be used to embed collaboration principles in policy direction to address gaps inherent to the innovation ecosystem, as well as to establish a central approach to facilitating the collaboration. The research identified that significant collaboration with other roles were required for an innovation hub to realise outcomes for members and community impact. An innovation hub requires the development of other roles including local risk capital in the form of angel investors, an engaged business mentor community, supporting industry groups, thriving industry and technology communities, and alignment with government strategy. Policy developments in a region require a portfolio of policy initiatives to ensure a systems approach rather than sole investment in an innovation hub. Approaches such as collective impact and backbone organisations can help to coordinate and align these initiatives. Policy can help facilitate collective impact approaches.

Third, the research highlights how policy can better accommodate peripheries such as geography, gender, age, or cultural heritage as compared to those in the core that have better access to resource availability, quality, and flow (Friedmann, 1969; Fair, 1965; Krugman, 1991). Delivery of innovation ecosystem services designed for the majority risk overlooking those in the minority (Kimmel & Coston, 2018; Xu & Dobson, 2019). Supporting those not in the majority can require additional cost, effort, and political will. However, government may be the only role incentivised to support the service. Initiatives frequently focus on attempting to make the periphery look more like the core, such as implanting programs that work in a metro setting into a regional community or programs that do not accommodate participant demographic characteristics. There is an opportunity to design programs that explicitly celebrate and capitalise on the unique value inherent to the periphery (Lewis, Harper-Anderson, & Molnar, 2011).

Fourth, the research highlights the need to identify outcomes beyond financial sustainability of the innovation hub. In 2004, the Australia New Zealand Association of Business Incubators (ANZABI) provided a report funded by AusIndustry on *Case studies of Australian small business Incubators and their impact* (2004). The report identified a series of lessons learnt and best practice standards for incubators at the time. In particular, the report noted in a section title ‘market failure’:

“Incubators do not provide a financial return to investors or owners. In place of the financial return, incubators provide enhanced social and community outcomes. Where there is a surplus of income over expenditure, a better practice is to plough funds into increased services for tenants to further leverage returns for the community – and this could include provision of finance or risk capital.” (p. 17).

The value and business model of the innovation hub seemed to not be understood by many interviewees. Roles responsible for supporting innovation hubs often looked for a more positive financial position or lacked clarity on the non-financial contribution. The findings of the report made over 15 years ago are still found to be relevant in the current research. It is the hope that this research contributes to a better understanding for policy makers of the value and contribution of the innovation hub.

9.3 Contribution to practice

Innovation hubs and innovation ecosystem development is an emerging field with new professions. Practitioners are often learning on the job and there is little professional development for the roles. Factors of leader and practitioner burnout and a need to build personal capability were evident in the interviews. This research provides guidance to practitioners for strategy development and professional accountabilities.

First, the framework allows practitioners to triage their local ecosystem to identify strengths and weaknesses, gaps and redundancies, and develop appropriate strategies. For example, an audit of contributing factors against functions from Figure 8-5 may inform strategies and collaboration opportunities. If the innovation hub is not delivering structured programs, if programs are stand-alone and not integrated with other stakeholders, and the innovation hub does not have a specialised focus, then the research finds that there is less likely to enable and may actively inhibit community resilience and may activity. In other words, specialist/focused rather than generalized incubators may have narrower appeal to funders, but are more likely to enable rather than inhibit community resilience.

Second, the conceptualisation of functions helps innovation hub managers to prioritise activities towards core and internal functions, while working with other roles on external influence and having an awareness of external concern functions. As noted in literature and this research, innovation hubs operate under a financially challenged business model. Innovation hub resources are scarce. An awareness of what functions are core can help innovation hubs focus efforts where there is the greatest impact. Practically, the framework of

core, internal, external influence, and external concern functions provides a framework by which innovation hub managers can develop their strategy plans.

Third, the research provides a means by which practitioners can communicate the impact of their activities to facilitate continued support from roles that have a vested interest in outcomes related to community resilience. Addressing the lack of reporting, low perception of value, and lack of trust, reporting outcomes against specific dimensions of community resilience can align activities and value propositions of roles in the innovation ecosystem. Innovation hubs can correlate the indicators in Section 4.5 and contributions from Chapter 7 with innovation hub programs and initiatives. For example, an innovation hub may associate a program with the institutional dimension indicator of “Knowledge and information transfer and best practice sharing (inter and intra city)” and social/individual dimension indicators of “Strong international civic organisations” and “Gender norms and equality” for a program that attracts participants across multiple regions, offers collaboration with overseas markets, and focuses on female entrepreneurs. The program can then attract other stakeholders with an interest in supporting these outcomes.

Fourth, the research helps convey the nature of the innovation ecosystem as a complex adaptive system, which is important for success of ecosystem services (Biggs et al., 2012). The innovation ecosystem is continuously adapting, emerging, and highly interconnected. An action in one area, such as implementing a program or establishing an innovation hub, has significant impact across many areas. Further, the influence of this impact can take time and results may not be readily apparent. An awareness of the complexity and interconnectedness of the network can help manage expectations of all roles and encourage collaboration.

9.4 Limitations and opportunities for future research

There are limitations of this research which also highlight future opportunities. First, the integration of fields of innovation ecosystems and community resilience, as well as methods of actor network theory, critical realism, and appreciative inquiry are emerging. Critical realism has a history of application in the social sciences (Archer et al. 1995; Danermark, et al. 2002) and is emerging in entrepreneurship studies (Blundel, 2006; Mole, 2012; Hu, 2018) including examining the influence of incubators on entrepreneurs (Kemp, 2013). Actor network theory is seen as going against the dominant positivist stream of entrepreneurship research that focuses on models and frameworks and is only recently applied to innovation ecosystem research (Korsgaard, 2011). Examples of related SNA applications include actor proximity in

community resilience to disaster recovery (Magsino, 2009), gang movement and cultural resilience (Fleisher, 2009), the evolution of regional innovation networks (Cantner & Graf, 2006), the value of relational capital in innovation ecosystems (Russell et al. 2015) analysing innovation ecosystem ranking models in Europe (Huhtamäki & Rubens, 2016), and geographic and non-geographic collaborating clusters in regional tourism businesses (Kelman et al. 2016). This study builds on the history of each individual focus area and method, while acknowledging that integration of all the approaches has been limited up to now. The study highlights opportunities for future research to adapt and build on the use of actor network theory and critical realism for innovation ecosystem research.

A second limitation as previously noted relates to the sample selection. Three limitations include limited representation of a type of actor in a region, referrals from an elite respondent omitting fringe or emerging networks, and roles being defined for on an actor where the characteristics may not represent their full nature. Efforts were made in the selection process to broaden the actor type, expand the sampling beyond referrals from a single network, and coding interviewees to multiple roles based on the context of the interview content. Future research can expand the selection across roles and additional respondents within roles, as well as focus on specific areas for case comparisons.

A third limitation relates to the temporal aspect of community resilience. The research assesses perceptions on how the innovation hub contributes towards indicators of community resilience. What is not considered is the change process in a region and possible opposing views on the same activity. For example, actions resulting in a loss of government funding for a program may seem as through a negative impact at the time of the interview but may also free up funds for other initiatives and result in higher quality, industry-led programs. The research captures a perspective on contribution to community resilience at a point in time. What may be perceived as an inhibitor to resilience may be misinterpreted as a low tolerance for uncertainty and failure (Roundy et al. 2017). Reflections of an interviewee on role failure may also infer a resistance to learn, adapt, and change, an indication of ‘the dark side of resilience’ (Williams et al, 2017, p. 750). Future use of the data for a longitudinal analysis at a later date could also hold value.

A fourth limitation relates to how resilience in this research was objectively defined and subjectively assessed. This has the benefit of factoring in the individual’s evaluation, providing an easy and robust way to account for aspects of resilience, and ease of administration. However, the approach is also open to cognitive bias, priming, and social desirability from

applying an inherently normative position (Jones, 2018). This was accommodated in part through a larger interview sample selection across multiple regions, and using critical realism to consider the narratives against literature and what could be observed. Future research can incorporate additional objective data for each indicator to corroborate the subjective assessments.

A fifth limitation pertains to the lack of specificity and identifying causal factors in the contributions of the innovation hub. As noted in Section 8.2, the focus of the research questions was on describing the nature of the contribution of innovation ecosystems and innovation hubs towards community resilience, at the expense of detailing why or the contribution occurred or other influencing variables. Ecosystem research can be at times abstract to reflect system inferences (e.g., ‘innovation hubs may contribute in these ways’) or detailed prescriptions (e.g., ‘this type of innovation hub impacts on individual mental health under these conditions’). This thesis attempts to balance these two positions, while leaning towards flexibility and abstract over specificity at the risk of supporting criticism of lack of generalisable application (Spigel & Harrison, 2017). It is expected that future research will expand on the framework to further identify causal factors. Sixth, the research relied heavily on interpretations of individual narratives to develop the contributing factors and subsequent observations. These efforts are made acknowledging challenges inherent to qualitative research of interviewee recollection and bias. Some attempt was made to mitigate this through an increased number of different interviews from participants in similar roles, conducting multi-coder analysis, and applying some consideration of prior research and observed data in keeping with a critical realism perspective.

Additional rigour could be applied through incorporating additional data sources to test the causal inferences. For example, Observation 4 relating to ecosystem maturity could be tested against variables to provide a more empirical assessment of ecosystem maturity, geography, and periphery group or the longitudinal factor inherent to Observation 6 could be analysed over time. In addition, a more structured case study approach could be applied to compare contributing factors between ecosystems, between types of innovation hubs, and over time in one or more ecosystems.

With these limitations in mind, the research method provides insights into how innovation hubs contribute towards community resilience from the perceptions of diverse participants in the innovation ecosystem across multiple regions. The research is exploratory and provides a

framework on which future research can build. As mentioned, additional objective data can be applied to each indicator to support the subjective assessment with other empirical data.

The research was also applied broadly across the state of Queensland. Future research could apply the approach to specific case studies by increase the number of interviews and distribution of interview roles in each region. The research focused on the role of the innovation hub. Future research could focus on additional roles such as risk capital or local government.

9.5 Conclusion

Systems theory provides a logical basis by which to understand the innovation ecosystem. Critical realism and actor network theory are suitable lenses by which to consider roles and impacts of the innovation ecosystem given its emerging and dynamic nature and ambiguity. There has been significant recent growth in and investment into the Queensland innovation ecosystem, including the establishment of innovation hubs in regional communities. Community resilience is an assumed outcome from this investment, but there has been little explicit measurement of this impact.

This research highlighted the contribution that the innovation ecosystem and specifically the innovation hub has in community resilience. While innovation ecosystems could be presumed to be inherently beneficial, this research identified that the contribution can be both enabling and inhibiting across all dimensions of community resilience. This research contributes to literature, policy, and practitioners by providing both a framework to consider the impact of the innovation ecosystem and the role of the innovation hub on community resilience, but also a theoretic and practical means by which roles and functions can be defined and understood.

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APPENDIX 1: ETHICS APPROVAL

On Tue, Sep 25, 2018 at 2:06 PM <human.ethics@usq.edu.au> wrote:

Dear Chad

I am pleased to confirm your Human Research Ethics (HRE) application has now been reviewed by the University's Expedited Review process. As your research proposal has been deemed to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007), ethical approval is granted as follows.

Project Title: H18REA223 - PhD research into The role of innovation hubs in building community resilience

Approval date: 25/09/2018

Expiry date: 25/09/2021

USQ HREC status: Approved with conditions

- (a) responsibly conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal;
- (b) advise the University (email: ResearchIntegrity@usq.edu.au) immediately of any complaint pertaining to the conduct of the research or any other issues in relation to this project which may warrant review of the ethical approval of this project;
- (c) promptly report any adverse events or unexpected outcomes to the University (email: ResearchIntegrity@usq.edu.au) and take prompt action to deal with any unexpected risks;
- (d) make submission for any amendments to the project and obtain approval prior to implementing such changes;
- (e) provide a progress 'milestone report' when requested and at least for every year of approval;
- (f) provide a final 'milestone report' when the project is complete.
- (g) promptly advise the University if the project has been discontinued, using a final 'milestone report'.

Additional conditionals of approval for this project are:

- (a) Nil.

Please note that failure to comply with the conditions of this approval or requirements of the Australian Code for the Responsible Conduct of Research, 2018, and the National Statement on Ethical Conduct in Human Research, 2007 may result in withdrawal of approval for the project.

If you have any questions or concerns, please don't hesitate to make contact with an Ethics Officer.

Congratulations on your ethical approval! Wishing you all the best for success!

Kind regards,

Human Research Ethics

University of Southern Queensland

Toowoomba – Queensland – 4350 – Australia

Ph: 07 4687 5703 – Ph: 07 4631 2690 – Email: human.ethics@usq.edu.au

APPENDIX 2: PARTICIPANT INFORMATION SHEET

Project Details

Title of Project: The role of innovation hubs in building community resilience
Human Research
Ethics Approval HXXREAXXX
Number:

Research Team Contact Details

Principal Investigator Details

Chad Renando
Email: chad.renando@usq.edu.au
Telephone:
Mobile: 0479 117 101

Supervisor Details

Professor Retha Wiesner
Email: retha.wiesner@usq.wedu.au
Telephone: (07) 3470 4519
Mobile: 0412 471 839

Description

This project is being undertaken as part of a PhD.

The purpose of this project is to better understand the role that innovation hubs play in building community resilience, with an emphasis on regional communities. Regions across Australia are being researched, and key individuals interviewed to gain perspectives of people in the local community in relation to local innovation activity.

Your input is requested because you are part of your local community and can provide a unique perspective about the local innovation activity.

Participation

Your participation will involve participation in an individual and/or group interview that will take approximately 30 to 60 minutes of your time. The interview will take place at a time and venue that is convenient to you.

Questions will relate to:

- your relationship with the local innovation hub and related activities;
- your perspectives on examples of activities over the past 12 months;
- your views on what success might look like for innovation activity in your region over the next one to three years; and
- actions that might contribute towards that success.

The interview will be audio recorded for help with transcription and documentation. Some video may also be used.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You may also request that any data collected about you be destroyed. If you do wish to withdraw from this project or withdraw data collected about you, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

It is expected that this project will directly benefit you by identifying opportunities to support innovation activities in your region. You may also benefit from sharing about positive aspects of your stories on social media. It may also benefit others in your region who are recipients or providers of innovation-related services.

Risks

Risks associated with this project are expected to be minimal, if any. Some specific interview material is captured on video, which may be used for promotion of the region. You will have an opportunity to review representation prior to release.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law.

For audio and video recording, material will be destroyed after the required research holding period of 15 years. Audio and video recordings will be accessed by the research team for analysis and transcription. Transcription will be performed by tools through automated third parties such as Google and IBM. Video recordings may be used as promotional material for your local community, and some elements of the video recording may be used for future documentary by a third-party media agency. You will have the opportunity to review and approve video material before release. Recording of interviews is to provide accuracy and review following the interview but is not mandatory.

Data collected may also be used by future researchers.

Some data may be made public through the not for profit research project website www.startupstatus.co. This information includes information that could otherwise be known about your organisation (eg., address, size, function, information available on public websites).

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

APPENDIX 3: COMMUNITY RESILIENCE INDICATORS FROM LITERATURE

Model	Dimension	Variable
Disaster resilience of place (DROP) model (Cutter et al. 2008)	Ecological	<ul style="list-style-type: none"> • Wetlands acreage and loss • Erosion rates • % impervious surface • Biodiversity • # coastal defence structures
	Social	<ul style="list-style-type: none"> • Demographics (age, race, class, gender, occupation) • Social networks and social embeddedness • Community values-cohesion • Faith-based organizations
	Economic	<ul style="list-style-type: none"> • Employment • Value of property • Wealth generation • Municipal finance/revenues
	Institutional	<ul style="list-style-type: none"> • Participation in hazard reduction programs (NFIP, Storm Ready) • Hazard mitigation plans • Emergency services • Zoning and building standards • Emergency response plans • Interoperable communications • Continuity of operations plans
	Infrastructure	<ul style="list-style-type: none"> • Lifelines and critical infrastructure • Transportation network • Residential housing stock and age • Commercial and manufacturing establishments
	Community competence	<ul style="list-style-type: none"> • Local understanding of risk • Counselling services • Absence of psycho pathologies (alcohol, drug, spousal abuse) • Health and wellness (low rates mental illness, stress-related outcomes) • Quality of life (high satisfaction)
Community resilience as a set of networked adaptive capacities (Norris et al. 2008)	Information and communication	<ul style="list-style-type: none"> • Narratives • Responsible media • Skills and infrastructure • Trusted sources of information
	Community competence	<ul style="list-style-type: none"> • Community action • Critical reflection & problem solving skills • Flexibility and creativity • Collective efficacy / empowerment • Political partnerships
	Social capital	<ul style="list-style-type: none"> • Received (enacted) social support • Perceived (expected) social support • Social embeddedness (informal ties) • Organisational linkages & cooperation • Citizen participation / Leadership & roles (formal ties) • Sense of community • Attachment to place
	Economic development	<ul style="list-style-type: none"> • Fairness of risk & vulnerability to hazards • Level of diversity of economic resources • Equity of resource distribution
Community Economic Resilience (CER) Constructs (Dinh & Pearson, 2016)	Human capital	<ul style="list-style-type: none"> • Education • Skills • Health
	Financial capital	<ul style="list-style-type: none"> • Money that is invested in any productive activities
	Natural capital	<ul style="list-style-type: none"> • Natural resources (e.g. air, water, land, flora and fauna) • Ecological systems from the natural world
	Physical or built capital	<ul style="list-style-type: none"> • Physical assets generated by applying human productive activities to natural capital and is capable of providing a flow of goods and services
	Social capital	<ul style="list-style-type: none"> • Networks, together with shared norms, values and understanding that facilitate co-operation within or between groups

Model	Dimension	Variable
	Diversity of economic structure	<ul style="list-style-type: none"> • Industry size • Industry mix • Region to nation Industry mix comparison
	Accessibility	<ul style="list-style-type: none"> • potential for interactions between locations in space • Weight: a measure of the number of opportunities available at a given location • Impedance: the cost of overcoming the distance that separates a second location from those opportunities
Community and Regional Resilience Initiative (CARRI) (Cutter et al, 2008)	Social Vulnerability	<ul style="list-style-type: none"> • Race and ethnicity: % African American; % Native American; % Asian or Pacific Islanders; % Hispanic • Age: % population under 5 years old; % population 65 or older; median age • Socioeconomic status: Per capita income; % families earning more than \$100,000; median dollar value of owner-occupied housing • Gender: % female; % females in civilian labor force • Employment: % of the civilian labor force unemployed; % civilian labor force participation • Education: % population over 25 with less than high school education • Household structure: Average number of people per household; % families living in poverty; % female-headed households, no spouse present • Access to services: Number of physicians per 100,000 population; % rural farm population; % urban population • Occupation: % employed in fishing, farming, forestry; % employed in transportation, communications, public utilities; % employed in service occupations • Housing: % housing units that are mobile homes; % renter-occupied housing units; median gross rent (\$) for renters • Special needs: Nursing home residents per capita; % Social Security recipients; % migrate to the United States from abroad in last 5 years
	built environment and infrastructure	<ul style="list-style-type: none"> • Residential: Median age of housing units, Housing units built before 1960, Density of housing units, Density of mobile homes, Number of building permits for new housing units, Daily water usage, Value of all residential property • Commercial and industrial development: # commercial establishments, # manufacturing establishments, Value of sales for all businesses (\$), value of all sales for all farms, Industrial earnings (\$), Banking offices, Private non-farm business establishments, Hazardous materials facilities, # Small businesses, # marinas • Lifelines: Hospitals, Schools, Electric power facilities, Potable water facilities, Wastewater facilities, Dams, Police stations, Fire stations, Oil and natural gas facilities, Nuclear facilities, Emergency centers, Number of hospital beds, Communications towers/antennae • Transportation infrastructure: Airports, Bus terminals, Ferry facilities, Interstate miles, Other principal arterial miles, Fixed transit and ferry network miles, Rail miles, Highway and rail bridges, Ports • Monuments and icons: Churches, Landmark and Historic registry buildings, parks, social organizations
	Natural systems and exposure	<ul style="list-style-type: none"> • Area of dunes • Average dune height • Average beach width • Erosion rates • Acreage of wetlands • Wetland/habitat loss (% change from previous decade) • Acreage of undisturbed habitat • Coastal subsidence (rate per year) • Sediment supply (estimated berms and offshore bars) • # and location of coastal defenses (groins, jetties, seawalls, revetments) • # and size of storm water detention basins • Water contamination (surface and ground) • 100-year and 500-year flood zones delineations • Storm surge inundation zones • Land cover classification • Amount of impervious surfaces • Projected Sea Level rise from Intergovernmental Panel on Climate Change reports IPCC

Model	Dimension	Variable
	Hazards mitigation and planning for resilience	<ul style="list-style-type: none"> • Disasters/emergency response plans (household and community) • Building standards, codes and enforcement • Hazard mitigation plans and hazard vulnerability assessments (required by the Disaster Mitigation Act of 2000) • Comprehensive plans (land use and growth management) • Zoning ordinances prohibiting development of high hazard areas • Continuity of operations plans for local governments • Interoperable communications among police, fire, and emergency responders • Disaster recovery plans • Participation in the National Flood Insurance Program (NFIP) • Coastal setbacks for development • Dune management districts • Transfer of development rights to discourage development in sensitive areas • Fiscal policies to shift public infrastructure costs (water, sewer, roads) to developers • Provision of risk/hazard information to the public • Tabletop and mock exercises and drills for disaster response
Resilience index (Briguglio, 2009)	Macroeconomic stability	<ul style="list-style-type: none"> • Fiscal deficit-to-GDP ratio • Sum of the unemployment and inflation rates • External debt-to-GDP ratio
	Microeconomic market efficiency	<ul style="list-style-type: none"> • Economic Freedom of the World Index - regulation of credit, labour and business <ul style="list-style-type: none"> ○ Extent the banking industry is dominated by private firms ○ Extent foreign banks are permitted to compete in the market ○ Extent credit is supplied to the private sector ○ Extent controls on interest rates interfere with the credit market
	Good governance	<ul style="list-style-type: none"> • Economic Freedom of the World Index – legal structure and security of property rights <ul style="list-style-type: none"> ○ judicial independence ○ impartiality of courts ○ the protection of intellectual property rights ○ military interference in the rule of law ○ political system and the integrity of the legal system
	Social development	<ul style="list-style-type: none"> • UNDP human development index (HDI) - education and health indicators <ul style="list-style-type: none"> ○ Educational advancement <ul style="list-style-type: none"> ▪ adult literacy rate ▪ school enrolment ratios ○ Life expectancy at birth
Multifunctionality of Economic capital (Wilson, 2010)	Economic capital	<ul style="list-style-type: none"> • Economic well-being • Diversified income streams (e.g. pluriactivity) • Low dependency on external funds (e.g. agricultural subsidies) • Multifunctional businesses • Integration into global capitalist system • Happiness
	Social capital	<ul style="list-style-type: none"> • Close interaction between rural people (tight-knit communities) • Availability of skills training and education • Good health and sanitation • Multifunctional services • Good communication between stakeholder groups • Female empowerment/empowerment of ethnic minorities in rural areas • Open-minded communities (ability to accept change) • Good and transparent land ownership regulations (control over means of production) • Rural stakeholders in control of development trajectories • Strong governance structures at multiple geographical scales (democratic participation)
	Environmental capital	<ul style="list-style-type: none"> • High levels of biodiversity • Good water quality and availability • Sustainable soil management • Predictable agricultural yields • Sustainable management of environmental resources in rural community • Multifunctional environmental resources
Resilience Performance Scorecard (RPS) (Burton et al. 2017)	Awareness & Advocacy	<ul style="list-style-type: none"> • Current status and main achievements in risk assessment and raising public awareness. • Level of awareness and knowledge of earthquake risk. • Information about earthquake safety, preparedness, and risk reduction. • Public outreach activities for disaster safety, preparedness and risk reduction. • Training and capacity building programs to increase technical and professional resources for earthquake risk reduction.

Model	Dimension	Variable
	Social capacity	<ul style="list-style-type: none"> • Availability of healthcare and social assistance programs for vulnerable groups. • Ties and connections between people among their, e.g. neighbourhood, municipality, district, canton, sub-city, parish, and so forth. • Social integration considering different economic levels. • Access to electricity, gas, and clean water. • Primary education. • Social integration of minority populations. • Interaction between formal (governmental) and informal institutions. • Participation in decision-making. • Programs for the protection of historic buildings and cultural heritage.
	Legal and institutional arrangements	<ul style="list-style-type: none"> • Status of regulations, ordinances, or incentives for earthquake safety and risk reduction. • Prevalence of persons with roles and responsibilities for disaster risk reduction. • Mechanisms of coordination and cooperation for disaster preparedness, safety, and risk reduction. • Confidence in the central and local government and non-governmental institutions to prepare for, respond and recover from a damaging earthquake
	Planning, regulation, and mainstreaming risk mitigation	<ul style="list-style-type: none"> • Status and main achievements of planning, regulation and mainstreaming risk mitigation. • Earthquake resistant building construction codes. • Reinforcement and retrofitting of private infrastructure. • Availability and use of earthquake insurance.
	Emergency preparedness, response, and recovery	<ul style="list-style-type: none"> • Access to goods such as food and water that can be utilized following a damaging earthquake event. • Prevalence of local centres for implementing and coordinating emergency response and management. • Standard operational procedures for coordinating emergency rescue and response activities. • Funds for emergency preparedness, response and recovery operations. • Human resources and equipment for emergency preparedness, response, and recovery operations. • Planning for post-earthquake emergency operations.
	Critical services and public infrastructure resilience	<ul style="list-style-type: none"> • Structural mitigation to reduce the seismic risk of lifelines and critical facilities. • Incorporation of non-structural mitigation to reduce seismic risk within lifelines and critical facilities. • Business Continuity Planning (BCP) for local government offices in the aftermath of a damaging earthquake. • Plans for the repair or replacement of critical lifelines in the aftermath of a damaging earthquake event.
Model of community wellbeing and resilience (McRea et al., 2016)	Community wellbeing	<ul style="list-style-type: none"> • Personal safety • Income sufficiency • Health • Services and facilities • Built environment • Environmental loading • Environmental management • Economic opportunities • Community and social interaction • Community spirit and cohesion
	Community resilience	<ul style="list-style-type: none"> • Community decision making and trust • Trust in industry decision making
Emotional stability, resilience and perceptions of change (Bec et al. 2015, 2018)	Emotional stability	<ul style="list-style-type: none"> • Optimistic • Nervous • Stressed • Depressed • Mood swings • Ability to cope • Happy with lifestyle

Model	Dimension	Variable
	Community resilience	<ul style="list-style-type: none"> • Can access funds for dealing with short-term disasters • Can access insurance coverage for major public and private assets • Has a diverse economy and workforce • Has leaders who adjust quickly to change • Has strong leaders who work well together • Has long-term plans aimed at ensuring a diversified economy • Has long-term plans that aim to manage resources sector development • Has long-term plans that aim to manage tourism development • Has opportunities for education, training and learning • Integrates and shares knowledge amongst stakeholders • Is made up of people who support each other • Is made up of people who trust each other • Is regularly informed about changes affecting the community • Participates in risk and vulnerability planning • Plans for disasters, loss, hazards, vulnerabilities and risk • Prepares and trains for long-term change • Prepares and trains for short-term change • Works well together across internal and external bodies
	Perceptions of change	<ul style="list-style-type: none"> • Opportunity / Threat • Positive / Negative • Adaptive / Inflexible • Pleasant / Unpleasant • Exciting / Gloomy
Indicators of Adaptive capacity (2017)	Human Capital	<ul style="list-style-type: none"> • Proportion of people aged 15–64 who have completed year 12 or higher • Proportion of people aged 15–24 fully engaged in work or study • Proportion of employed people in high- to medium-skilled occupations (loosely corresponding with a Certificate III or IV qualification or above) • Proportion of the labour force who are employed • Proportion of people aged 15–64 who were working or looking for work • Ratio of long-term Newstart Allowance recipients to population aged 15–64 • Proportion of people aged 15–64 • Proportion of people who identify as Indigenous • Ratio of patent applicants to population • Ratio of trademark applicants to population • Business entry and exit rates • Ratio of Disability Support Pension recipients to population aged 15–64 • Estimated proportion of people aged 15+ who self-assessed their health as better than fair • Estimated proportion of people aged 18+ with high or very high psychological distress • Estimated proportion of people aged 18+ with at least one of four health risk factors (current smoker, high risk alcohol consumption, obese, no or low exercise in the previous week)
	Financial capital	<ul style="list-style-type: none"> • Proportion of households with equivalised household income greater than \$1250 a week • Ratio of total investment income to population • Ratio of government income support recipients to population • Weighted average of median house and unit sale prices • Proportion of households who live in an owner-occupied dwelling with or without a mortgage • Estimated proportion of households that are in the bottom 40 per cent of the distribution of equivalised household income and are paying more than 30 per cent on mortgage or rent
	Physical capital	<ul style="list-style-type: none"> • Remoteness, based on Accessibility/Remoteness Index of Australia • Proportion of households that access internet from the dwelling • Ratio of mean value of non-residential building approvals over 2014–16 to population • Estimated proportion of people aged 18+ who do not find it difficult getting to places needed with transport
	Natural capital	<ul style="list-style-type: none"> • Proportion of employed people working in agriculture industry • Proportion of employed people working in mining industry • Proportion of land as national parks or nature reserves

Model	Dimension	Variable
	Social capital	<ul style="list-style-type: none"> • Proportion of people who volunteered • Estimated proportion of people aged 18+ who are able to get support in times of crisis from • persons outside the household • Estimated proportion of people aged 18+ or their partner who provide support to other • relatives living outside the household • Estimated proportion of people aged 18+ who felt very safe or safe walking alone in local • area after dark • Estimated proportion of people aged 18+ who felt they had experienced discrimination or • unfair treatment in the past 12 months • Estimated proportion of people aged 18+ who do not disagree with acceptance of other • cultures • Estimated proportion of people who are homeless
	Other	<ul style="list-style-type: none"> • Herfindahl index of industry diversity • Proportional change in population aged 15–64 over five years • Proportion of people who travel to work in a different region