

The role of VET in the entrepreneurial ecosystem

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About the research

The role of VET in the entrepreneurial ecosystem

Don Scott-Kemmis

How the vocational education and training (VET) sector can respond to changes in the economy to ensure development of the required skills for a contemporary labour market is a perennial topic of interest. The role of VET in developing entrepreneurship – an important element of the Australian economy – has recently attracted an increased focus internationally. However, there has been limited research in Australia on how the VET sector might play a larger role in the development of entrepreneurship and, more specifically, on how the sector might better position itself in an entrepreneurial ecosystem, defined as the formal and informal institutions and relationships that facilitate access to entrepreneurship-relevant resources such as information, finance, reputation and specific knowledge.

This research draws together international literature on teaching and learning for entrepreneurialism, with the goal of informing potential Australian developments in this area. The report also provides an Australian case study of the Australian Capital Territory, as an entrepreneurial ecosystem, to explore the extent to which the VET system has contributed to the development of the skills used by entrepreneurs in the early stages of forming new ventures. The ventures of interest were those that had been started in the past 25 years with the aim of expansion and high growth.

Key messages

- The literature shows that the case for initiatives to promote and support the development of entrepreneurship skills is widely accepted internationally, particularly across Europe. However, many of the initiatives in place are experimental and person-driven, rather than strategic or systemic.
- The ACT case study showed that either the company founder, or a member of the founding team, had a VET qualification in about 20% of the 97 start-up organisations identified. In most cases this person also had a university degree or considerable professional experience following graduation. Aside from some recent start-ups in the digital games market, that were supported by a specific and targeted VET program, none of the interviewed VET-qualified founders considered that their VET course had provided them with entrepreneurship skills.
- The increasing importance of entrepreneurial skills in the Australian economy provides an argument for the development of these skills in at least some VET qualifications, perhaps particularly those in information technology. Examples of how a program for entrepreneurship can work in the digital games market were uncovered in the ACT case study.
- Should a broad fostering of entrepreneurial skills be seen as necessary, a more strategic response would be required. The strong regional dimension of entrepreneurship could be used to shape the development of such a strategy, engaging regional VET organisations and systems. Of course, such a strategy will need to address how entrepreneurship skills should be taught, by whom, and for whom.

Dr Craig Fowler
Managing Director, NCVET

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Executive summary

Skills associated with entrepreneurship are becoming more important for the development of the economy and society.

In the context of ongoing globalisation and faster technological change, economies are becoming more entrepreneurial and more knowledge-intensive. Entrepreneurial economies and societies require institutions, organisations, regulations and relationships different from those of the industrial societies of the late twentieth century. Consequently, the skills associated with entrepreneurialism are becoming more important for the development of the economy and society, which means that the acquisition of these skills is also becoming a more important objective for education and training.

This report explores the concept of entrepreneurialism in the twenty-first century, noting particularly the challenges implicit in the implementation of entrepreneurial practices, including teaching and learning for entrepreneurship, specifically for the vocational education and training (VET) system. One of the objectives of this project was to gain an international overview of the current state of entrepreneurship and education for entrepreneurship, to provide a backdrop with the potential to inform and assess Australian developments and policy in this area.

This research project uses two components to explore the entrepreneurial ecosystem: a review of the current research and an Australian case study – of the Australian Capital Territory. An ‘entrepreneurial ecosystem’ is defined as the formal and informal institutions and relationships that facilitate access to such entrepreneurship-relevant resources as information, finance, reputation and specific knowledge, including education. The research is guided by the following research questions:

- What is the significance, and what are the components, of entrepreneurial ecosystems?
- To what extent are Organisation for Economic Co-operation and Development (OECD) countries introducing elements of entrepreneurship skill development into VET programs and developing initiatives to link to the wider development of entrepreneurial activity?
- To what extent do, or could, VET organisations, staff, programs and graduates play significant roles in entrepreneurial ecosystems?
- To what extent does the VET system in the ACT contribute to the development of skills used by entrepreneurs in the early stages of forming new entrepreneurial ventures?

The literature review and the associated analysis highlight the rising levels of entrepreneurship (and enterprise) internationally and note that education and training systems must play a more effective role in addressing this important development. The literature reveals the growing importance of entrepreneurship and identifies the reasons for this growth, which generally are economic, technological and social.

The review examines the literature on the initiatives being introduced by comparable countries to develop entrepreneurial and enterprise skills. Recognising the increasing importance of entrepreneurship (and enterprise) in knowledge-based economies, the last two decades have seen an increased emphasis on the development of entrepreneurial skills, with elements of entrepreneurship incorporated into all levels of education. The review finds that numerous studies and reports aim to identify key entrepreneurship skills and attitudes and to understand how they are acquired. Several countries have introduced significant new initiatives in their various VET systems, although across the OECD the

The case study of the ACT suggested VET played a minimal role in preparing start-up founders for entrepreneurship.

current situation is uneven, with these initiatives taking place in a context of ongoing experiment and assessment. This overview of initiatives relating to entrepreneurship education offers a useful insight for Australia, despite significant differences in the structure of the VET system across countries.

The review reveals that there is a general consensus that strengthening 'enterprise skills' – problem-solving, self-reliance, initiative, risk taking, flexibility, creativity – is essential and is strongly supported by business. Many see 'entrepreneurship' skills – those required for forming a new enterprise – as a necessary part of the initiatives. That leads onto such questions as how these skills are developed. A diverse range of approaches have been introduced in VET in different countries: student enterprises as part of the course, simulations, mentoring, business plan competitions etc. One issue that has emerged as central is the importance of real-world contexts for learning entrepreneurial skills, and the role of business and industry in supporting these approaches.

In the context of rapid entrepreneurship growth, the review investigated the significant role of entrepreneurial ecosystems. Some regions have emerged as 'hot spots' of entrepreneurial activity, for example, Silicon Valley, in the United States, and the review examines the background of these entrepreneurship-intensive areas, specifically to identify the role of education and training providers, as they are participants in these developing ecosystems. It is found that these ecosystems are not created through government policy, but evolve over time through bottom-up activity, and with the addition of supportive government policy and funding. In many cases, universities, research centres and other higher education organisations are important actors in entrepreneurial ecosystems and have evolved to support, and benefit from, growing resources and from deepening interaction with other actors in the ecosystem.

The case study on the Australian Capital Territory sought to identify all significant start-ups in the ACT over the past 25 years in order to identify the founders and to explore their backgrounds. The firms of interest to this study were those ventures formed with the ambition of addressing a market (national and international) beyond the ACT. The ACT has an increasing level of entrepreneurship and a rich entrepreneurial ecosystem, which includes several entrepreneurship support organisations. For those firms where VET graduates were involved in their establishment, the study sought to understand the main features of the firm-formation process, while the role of the local VET providers in supporting entrepreneurship was explored. The survey of start-ups in the ACT over the past 25 years found that, in about one in five of the ACT start-ups, the founder or a member of the founding team had a VET qualification, although these VET graduates considered that their experience of education and training through VET played little role in preparing them for entrepreneurship.

Implications of the review and case study for the Australian context

The emergence of a more entrepreneurial economy has unavoidable implications for the VET system in Australia, particularly given that Australia currently has no coherent national policy on entrepreneurship or education for entrepreneurship (although there has been support for start-ups and commercialisation). The key issues arising from the review and the case study could be incorporated into a national strategy on entrepreneurship for Australia, one that takes account of the educational requirements for entrepreneurship and

necessarily involves the tertiary education sector, which includes the VET system. The following represent the main implications of this review and are identified as relevant to the formulation of a national strategy:

A national strategy for entrepreneurship would be beneficial, and could encompass education needs.

Strategy development

- The significance of the growth of entrepreneurship internationally and in Australia suggests a need for Australia to develop a comprehensive entrepreneurship strategy, one which also encompasses education for entrepreneurship. While there have been programs to support entrepreneurial start-ups, an overall strategy to pull together the various elements of entrepreneurship in Australia would be of benefit.
- The strategy should be developed with reference to international and local experience and be guided by broadly based advisory bodies. Noting the evolutionary nature of successful entrepreneurial activities, an approach that strategically supports bottom-up initiatives and experiments is likely to be the most effective, although broad directional policies will be required to clarify the scope and objectives of initiatives and to set clear goals with measurable performance indicators. National programs should also encompass support for local area initiatives (program experiments, business plan competitions and co-working spaces).

Entrepreneurship learning

- There is strong evidence that enterprise and entrepreneurial skills are becoming more important for career success in the knowledge-intensive economies of the twenty-first century. This offers a compelling case for ensuring that enterprise skills are a key component of most VET courses and for including entrepreneurship skills and knowledge in at least some vocational education programs, perhaps particularly those in IT.
- The approach to developing entrepreneurial skills must emphasise practice-based learning; it will also be essential to involve experienced entrepreneurs in entrepreneurship-development activities and it will be important for VET institutions to build links with the existing entrepreneurship support organisations in their region and to ensure that VET students are aware of these support resources.

Entrepreneurship teaching

- Developing the entrepreneurial knowledge and skill of VET educators will require sustained investment and involve their ongoing exposure to current entrepreneurial activity to ensure they remain up to date in the field; it will be crucial for these educators to interact with other regional and national entrepreneurship development programs.
- VET providers will need to build links with the existing entrepreneurship support organisations in their region, including incubators, business service providers, networks, mentoring bodies, and to ensure that VET students are aware of these support resources.
- Developing cooperative links with business organisations and associations in their region will be important to VET providers, as these relationships facilitate the use of real-world experiences for developing staff and students. Also important will be recognition of the fact that for many smaller firms the transaction costs of interaction are likely to be a major impediment to collaboration in any form. It may be feasible for VET organisations,

with support from local government (and perhaps business associations), to develop or strengthen the services to small firms, enabling them to link to VET providers.

Regional partnerships

- The importance of the regional dimension of entrepreneurship suggests that regional strategy development processes and regional entrepreneurship ecosystems will be critical, including for shaping the development of strategy at the level of regional VET organisations and systems.

Introduction

In the context of ongoing globalisation and faster technological change, economies are becoming more entrepreneurial and more knowledge-intensive. Entrepreneurial economies and societies require different institutions, organisations, regulations and relationships to those of industrial societies of the late twentieth century. Consequently, the skills associated with entrepreneurship are becoming more important for the development of the economy and society, which means that the acquisition of these skills is also becoming a more important objective for education and training.

This report explores the concept of entrepreneurialism in the twenty-first century, noting particularly the challenges implicit in the implementation of entrepreneurial practices, including teaching and learning for entrepreneurialism, specifically for the VET system. One of the objectives of this project was to provide an international overview of the current state of entrepreneurship and education for entrepreneurship to provide a backdrop with the potential to inform and assess Australian developments and policy in this area.

This research project uses two components to explore the 'entrepreneurial ecosystem': a review of the current research and an Australian case study of the Australian Capital Territory (ACT). An entrepreneurial ecosystem is defined as the formal and informal institutions and relationships that facilitate access to entrepreneurship-relevant resources such as information, finance, reputation and specific knowledge, including education. The research is guided by the following research questions:

- What is the significance, and what are the components, of entrepreneurial ecosystems?
- To what extent are Organisation for Economic Co-operation and Development (OECD) countries introducing elements of entrepreneurship skill development into VET programs and developing initiatives to link to the wider development of entrepreneurial activity?
- To what extent do, or could, VET organisations, staff, programs and graduates play a significant role in entrepreneurial ecosystems?
- To what extent does the VET system in the ACT contribute to the development of the skills used by entrepreneurs in the early stages of forming new entrepreneurial ventures?

This report

An introduction to the challenges posed by entrepreneurship, as identified in the literature, follows this overview of the report. It includes discussions on the changing demands for skills and parallel definitions of enterprise and entrepreneurial skills, and also looks at what the literature has to say about new firm start-ups.

The second section looks at the literature on entrepreneurship and identifies that rising levels of entrepreneurship (and enterprise) are essential and that education and training systems must play a more effective role in addressing this important development. It discusses the growing importance of entrepreneurship and outlines the reasons for this growth.

The following section reviews how comparable countries are introducing initiatives to develop entrepreneurial and enterprise skills. In recognition of the increasing importance of

An entrepreneurial ecosystem is the formal and informal institutions and relationships that facilitate access to entrepreneurship-relevant resources, including education.

entrepreneurship (and enterprise) in knowledge-based economies, the last two decades have seen a heightened emphasis on developing entrepreneurial skills. This has been expressed in initiatives throughout the world to incorporate entrepreneurship elements into all levels of education.

The next section introduces an additional dimension to the growth of entrepreneurship: the significance and role of entrepreneurial ecosystems. It is clear that some regions have emerged as 'hot spots' of entrepreneurial activity and this section discusses what lies behind these entrepreneurship-intensive areas. This is important for the role of education and training providers, as they are participants in these evolving entrepreneurial ecosystems.

The case study of the Australian Capital Territory is the next focus of the report and begins with an outline of the structure of the regional economy and the characteristics of the emerging local 'entrepreneurial ecosystem'. The study sought to identify all of the significant start-ups in the ACT over the past 25 years, with the aim of identifying the founders and exploring their backgrounds. This section also discusses the role of the VET providers in supporting entrepreneurship.

The report concludes by drawing together the various elements in a discussion that steps back from the detail to address the central questions of the study. Finally, the potential components of a strategy for entrepreneurship in Australia are suggested, a strategy that would encompass education for entrepreneurship.

The entrepreneurial challenge

Entrepreneurship is an increasingly important activity for regions and countries, with the literature on the topic identifying three key reasons for the primacy of entrepreneurship (Audretsch & Thurik 2001; Thurik, Stam & Audretsch 2013).

The first reason being that more open markets and more rapid knowledge flows, both within countries and internationally, means levels of competition are rising. Therefore the longevity of firms – and often industries – is increasingly challenged. More open markets increase the potential for the rapid growth of new firms, through their greater potential to reach global markets (Christensen, Horn & Johnson 2008).

Secondly, the rising level of investment in new knowledge creation, for example, through research and development (R&D), increases the potential for innovative products and processes. Relatedly, the rising level of investment in education results in an increasing number of people able to use this new (and old) knowledge for innovation. Beyond the level of new knowledge creation, the information and communication technologies (ICT) have often played a transformative role. The strong and sustained increases in the performance of ICT, along with declining costs and the widening range of applications, have led to its impact on almost every business and activity. As a consequence, ICT has extraordinarily diverse applications across the economy, releasing an immense potential for innovation and entrepreneurship in the development of those applications. It is through entrepreneurship that the frontier of innovative opportunity is explored and opportunities for new value created.

The final reason the major share of employment generation is attributable to the growth of new firms. The vital and increasing role of entrepreneurial firms in economic development

is becoming widely recognised (Acs & Szerb 2007; Carree & Thurik 2003; Naudé 2011; Wong, Ho & Autio 2005). High-performing, usually new, firms account for only a small proportion (five to six per cent) of start-ups and small-to-medium enterprises (SMEs), but more than 70% of net job creation (Henriksson et al. 2015; Kelley, Bosma & Amorós 2010; van Stel 2006).¹ A World Economic Forum report, based on a survey across 10 countries and over 360 000 early-stage companies, found that the top one per cent of early-stage companies contribute 44% of total sector revenues created in the fifth year of a company's life, while the top five per cent contribute 72% and the top 10% contribute 84%; the results for job creation show a similar pattern (World Economic Forum 2011).

Changing demands for skills

The changing nature of work, as well as the growing opportunity for entrepreneurship, has implications for skill requirements. The growth of the knowledge economy increases the demand for higher levels of skills, but also changes the types of skills required in workplaces: they are often now more complex and more innovative (Etzkowitz et al. 2000; Hannon 2005; Rae 2010; Blenker et al. 2012; Levesque et al. 2000). The challenge is summarised in a report by the International Labour Organization (ILO 2011, p.1):

The globalization of markets is accelerating the diffusion of technology and the pace of innovation. New occupations are emerging and replacing others. Within each occupation, required skills and competencies are evolving, as the knowledge content of production processes and services is rising.

Research conducted under the auspices of the European Commission's Erasmus Programme identified that, in a widening range of work contexts, higher-level skills will be required, as will a heightened emphasis on the 'soft' skills of problem-solving, innovation and personal development:

By 2020, 20% more jobs will require higher level skills. Education needs to drive up both standards and levels of achievement to match this demand, as well as encourage the transversal skills needed to ensure young people are able to be entrepreneurial and adapt to the increasingly inevitable changes in the labour market during their career.

(Erasmus Multilateral Projects 2013, p.1)

In the Australian context, a recent report by the Foundation for Young Australians (2015, p.36) highlights the likely future impacts of technological change on skill requirements and on the types of jobs created, and specifically the capacity of education systems to recognise and adapt to these changes:

Given the overwhelming rate of enrolment by young people in fields of study that will be highly affected by automation over the next 10–15 years, Australia needs to consider whether our education system is adequately preparing students for the future of work. In particular, our vocational education is training the vast majority of its students (71%) for occupations where at least two-thirds of the roles will be highly affected by automation in the next 10–15 years. This analysis suggests that our tertiary and VET education systems need reform.

¹ In surveying the significance of innovation for Australia, Wood (2011) notes the lack of generally accepted definitions and indicators of entrepreneurial activity and outcomes, and hence the lack of satisfactory analyses of comparative national performance.

In a similar vein, a Business Council of Australia discussion paper (2006) claims that businesses are concerned that the technical skills provided by education and training systems are not meeting their needs for skills relating to creativity, initiative, oral business communication and problem-solving, and entrepreneurial skills generally in the workforce, concerns that are echoed in a recent World Bank report (2010, p.14):

In many economies, employers are searching for workers who possess behavioral skills such as teamwork, diligence, creativity, and entrepreneurship, essential to thrive in today's rapidly evolving, technologically driven globalized economies. Thus, just improving workers' technical and vocational skills will not always meet employers' needs – systems that build skills will also have to ensure that these added behavioral attributes are in place.

A set of papers discussing the implications for VET in Australia of the rising importance of innovation and innovation-related skills also identified the importance of skills such as those needed for problem-solving, creativity, entrepreneurship and initiative (Dawe 2004).

Highlighting the importance of entrepreneurial skills in the modern economy and echoing the views of many other researchers (for example, Onstenk 2003; Draycott & Rae 2011), Henry, Hill and Leitch (2005, p.101) argue that:

[At] all levels, there will be a greater need for people to have entrepreneurial skills and abilities to enable them to deal with life's current challenges and an uncertain future. Furthermore, whatever their career choice or personal situation, individuals will be able to benefit from learning an innovative approach to problem solving; adapting more readily to change; becoming more self-reliant and developing their creativity through the study of entrepreneurship. There is no doubt that in any economic climate such learning could have far-reaching benefits for society. It could be argued, therefore, that the need for entrepreneurship education and training has never been greater.

The case for initiatives to promote and support the development of entrepreneurial skills in the workforce is now widely accepted across Europe, with the European Commission identifying research and development projects that recognise the important role of education in developing entrepreneurial attitudes:

The role of education in promoting entrepreneurial attitudes and behaviours is widely recognised today. Transversal competences like creativity, sense of initiative and entrepreneurship will help young people to develop their capacity to think creatively and to innovate, to develop pro-activity, flexibility, autonomy, the capacity to manage a project and to achieve results. (European Commission 2012, p.6)

A survey carried out in 2013–14 in preparation for the 2014 European Forum on Vocational Training canvassed the views of firms, industry associations and VET providers, among others, on skill development needs and business–VET cooperation in the development of entrepreneurial skills (ICF GHK, Danish Technological Institute & Technopolis 2014). The report of the survey concluded that business was increasingly stressing the importance of developing 'entrepreneurial' skills in workers (p.35):

Almost all the business associations that were interviewed, be they sector bodies, SME bodies or employer associations, emphasise the importance of promoting entrepreneurial skills in the workforce. Many expressed the view that the workforce

holds a creative and innovative potential, which can be harnessed to the benefit the company.

What are enterprise and entrepreneurial skills?

It is useful to distinguish between *entrepreneurship* and *enterprise skills*, although this distinction is not always clear in many studies.² The National Consortium for Entrepreneurship Education, a US organisation that 'champions entrepreneurship education and provides advocacy, leadership, networking, technical assistance, and resources...' offers the following definition of entrepreneurship and the skills associated with its success:

Entrepreneurship is the ability to create and build something from practically nothing.

- It is initiating, doing, achieving and building an enterprise or organization, rather than just watching, analyzing, or describing one.
- It is the knack for sensing an opportunity where others see chaos, contradiction and confusion.
- It is the ability to build a 'founding team' to complement your own skills and talents.
- It is the know-how to find, marshal and control resources (often owned by others) and to make sure you don't run out of money when you need it most.
- Finally, it is the willingness to take calculated risks, both personal and financial, and then do everything possible to get the odds in your favour.

(Timmons cited in National Consortium for Entrepreneurship Education nd)

Jones and Iredale (2010) characterise entrepreneurship education in terms of a focus on new business development and hence on planning, launching and growing new ventures. From this perspective the objectives for skill and knowledge development centre on those for running a business and hence self-employment.

Enterprise skills, on the other hand, are those that enable opportunity identification, problem-solving, self-reliance, initiative, risk taking, flexibility, creativity and include those often referred to as transversal or 'soft skills'. A UK Department for Business, Innovation and Skills report on the impact of enterprise training defined enterprise skills as:

...the application of creative ideas and innovations to practical situations and viewed training for enterprise as developing individuals with the mind-set and skills to respond to opportunities, needs and shortfalls, with key skills including taking the initiative, decision making, problem solving, networking, identifying opportunities and personal effectiveness. (cited in OECD 2014, p.124)

While some would see enterprise education as also focused largely on the business context, others see it in terms of the many roles that an individual plays in society. For Jones and Iredale (2010), enterprise education is focused on being enterprising, taking an active approach to problem-solving, learning and personal development. In the UK the acquisition of enterprise skills was fostered prior to the more recent increased emphasis on entrepreneurial skills.

Onstenk (2003) suggests that this core set of skills and capacities is broadly shared between those who exercise enterprising skills in the workplace, those who seek self-employment

² See Pittaway & Cope (2007) for a more detailed discussion of definitions.

and those entrepreneurs who start and grow a business. He identifies these as: motivation, need for autonomy, creativity and originality, taking initiative, risk taking, opportunity-seeking, self-confidence, internal locus of control and flexibility.

Unfortunately, the distinction between entrepreneurial and enterprise skills is lost in some reports, and it is essential to note that the terms are often used loosely. For example, in a survey carried out in 2013–14 as preparation for the 2014 European forum on Vocational Training (cited earlier), it was found that almost all of the interviewed businesses (and sector bodies, SME organisations and employer associations) stressed the importance of developing 'entrepreneurial skills' in the workforce. But it is clear that the term was used to refer to what is more generally considered as 'enterprise skills':

A sense of initiative and entrepreneurship that refers to an individual's ability to turn ideas into action. It includes creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports individuals, not only in their everyday lives at home and in society, but also in the workplace in being aware of the context of their work and being able to seize opportunities, and is a foundation for more specific skills and knowledge needed by those establishing or contributing to social or commercial activity.

(ICF GHK, Danish Technological Institute & Technopolis 2014, p.35)

Similarly, in the European Union's Key Competence Framework, the 'entrepreneurship key competence' refers to an individual's ability to turn ideas into action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives (Eurydice 2012, p.5).

While noting this inconsistency in the terminology, more recent reports and policy documents tend to emphasise the importance of the distinction. Harte and Stewart (2012, p.332) argue that, while enterprise education and entrepreneurship education have different objectives, enterprise skills are a foundation for entrepreneurship skills.³ Mwasalwiba (2010, p.21) confirms the need to differentiate the two:

Different interpretations of entrepreneurship, enterprise, and an entrepreneur have far-reaching effects on the understanding of the objectives of entrepreneurship as a field of study, the setting of specific course objectives, the choice of target audiences, the design of course content, the teaching methods applied, and ultimately on evaluating progress and on the design of impact assessment frameworks.

Is self-employment or forming an SME equivalent to entrepreneurship?

New firm formation ranges from individuals aiming for self-employment, to entrepreneurs looking to launch the new Apple or Amazon. The establishment of new firms includes those essentially replicating well-established business models, with perhaps minor changes, for example, electricians, hairdressers, builders, accountants, solicitors, architects, and so on. By and large such firms remain small and service a local market – and their founders usually do not have ambitions to expand, with the ongoing investment and challenges that involves.

³ The distinction between entrepreneurship and enterprise education is widely debated (Gibb 1998; Jones & English 2004; Harte & Stewart 2012; Kuratko 2005).

While small business development and entrepreneurship have often been seen as closely related, it is more useful to consider them separately. Similarly, it is useful to distinguish between different types of entrepreneurship:

Entrepreneurship as a concept has multiple connotations. Depending on the sources of the definition, it could encompass a wide range of economic activities from self-employment and new venture creation to corporate venturing. Researchers have also distinguished between replicative entrepreneurship and innovative entrepreneurship.

(Fei Qin in Department of Industry, Innovation and Science 2015, p.48)

Henrekson and Sanandaji (2014, p.1760) also emphasise the distinction between replicative entrepreneurship and innovative entrepreneurship,⁴ arguing that it is misleading to consider self-employment as synonymous with entrepreneurship. They report research which shows fewer than 20% of small businesses report any innovative activity, while 75% do not plan to grow beyond a small size:

Both types of businesses are important for a well-functioning economy, but their workings are entirely different. Innovative and replicative businesses operate in different ways, but are not easily distinguishable in statistics (p.1760)

Hence, where the formation of a business is essentially to create self-employment and is based on the replication of long-established business models with no innovation in products, services or the organisation of work, the entrepreneurial dimension is low.⁵

Firms that are pioneering new scalable business models, based on new products, new processes that lower costs or new relationships with suppliers and customers, are more likely to open new markets and achieve high growth, but as they are more experimental they are also riskier and more demanding of entrepreneurial capability. It is these growth-oriented firms that are the focus of government entrepreneurship support initiatives and of this study.

Responses to this challenge

Recognising the potential of entrepreneurship to boost economic growth and employment, governments at the national and sub-national level have introduced measures to support entrepreneurship. These range from training and mentoring programs, to funding schemes and the support of incubators and similar support organisations. For example, the Entrepreneur's Programme is the Australian Government's current initiative that provides advice and support regarding commercialisation, innovation and entrepreneurship (Commonwealth of Australia 2017). A wide range of useful information to support entrepreneurship is available online. For students, future self-employment or business ownership is an increasingly attractive and feasible objective, while, as noted by Eurydice

4 See Baumol (2010) for a detailed exposition.

5 Such a business may go on to develop more entrepreneurial behaviours and objectives at a later time, but that is atypical. It is also the case that management of an increasing proportion of businesses, including SMEs, is becoming more demanding. As Tolentino (1998) points out, increasing knowledge intensity, collaboration with supplies and customers, more frequent change and the need to respond to opportunities and threats do raise increasing demands for innovation and entrepreneurial-type capability in SME managers. This suggests that enterprise skills are likely to be particularly relevant to all VET areas where self-employment is common.

(2012), the European Commission's network for lifelong learning, a new generation of entrepreneurial young people is required to ensure widespread economic growth:

A dynamic economy, which is innovative and able to create the jobs that are needed, will require a greater number of young people who are willing and able to become entrepreneurs ... who will launch and successfully develop their own commercial or social ventures, or who will become innovators in the wider organisations in which they work. Because education is key to shaping young people's attitudes, skills and culture, it is vital that entrepreneurship education is addressed from an early age.

Entrepreneurship education is essential.

(Eurydice 2012, p.5)



VET and the entrepreneurship challenge

Recognising the significance of entrepreneurial capability development

Changes in economies, career options and in workplaces present challenges to educational policy and organisations and have been a focus for intensive discussion for some time. In particular, the increasing importance of fostering 'entrepreneurial skills' has been raised by researchers and more recently incorporated into many statements of education and/or innovation policy. The recent report by the Foundation for Young Australians (2015, p.2) focuses on the challenge of better preparing youth for the future, emphasising the need for:

a generation of enterprising young people who are job builders and creators, not only job seekers ... Enterprising skills are transferable across different jobs and are a more powerful predictor of job success and performance, than technical knowledge.

The report goes on to make the case for reform to address the mismatch between the current educational offerings and the jobs available in the twenty-first century economy, arguing:

It may be worth exploring whether our tertiary institutions should be more directed at encouraging entrepreneurship, including self-employment. In particular, governments could explore the feasibility of making accessible HECS, FEE HELP, and government subsidised training in VET to students who participate in entrepreneurship education facilities run by successful entrepreneurs. (Foundation for Young Australians 2015, p.36)

For the European Commission, an 'entrepreneurial mindset' is now recognised as a key competence for European citizens, and entrepreneurship education should be developed at all education levels (Frank 2007; Jones & Iredale 2010). The European Framework of Key Competences, established through legislation in 2006, includes "traditional" skills such as communication in one's mother tongue, foreign languages, digital skills, literacy, and basic skills in maths and science, as well as horizontal skills such as learning to learn, social and civic responsibility, initiative and entrepreneurship, cultural awareness, and creativity'.⁶ The European Commission's Erasmus Programme identifies the importance of developing entrepreneurial skills:

One key policy issue for Member States and higher education institutions is to stimulate the development of entrepreneurial, creative and innovation skills in all disciplines. Attention should be particularly focused on the development of entrepreneurial skills because they not only contribute to new business creation but also to the employability of young people. The overall goal of entrepreneurship education is to give students the attitudes, knowledge and skills to act in an entrepreneurial way, for either a commercial or non-commercial objective. The Key Competence Framework states that the entrepreneurship key competence refers to an individual's ability to turn ideas into

⁶ See <http://ec.europa.eu/education/policy/school/competences_en>, viewed December 2016.

There are many international examples of entrepreneurship being included in vocational education.

action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives. (Erasmus Multilateral Projects 2013, p.3)

Ruskovaara (2014) identifies Finland as the first European Union country to embed entrepreneurship education in curricula at all education levels, from basic education to tertiary education, including VET. More recently, Norway, Germany and the UK have developed an entrepreneurship education policy for the whole education system (European Commission, Education, Audiovisual and Culture Executive Agency & Eurydice 2016).

Building entrepreneurial skills through VET

A review by the OECD (2014) of entrepreneurship in the VET system in one of its member countries noted that introducing entrepreneurship as a key competence in vocational education will lead to positive and mutually reinforcing outcomes for the individual in terms of employability and career success and also for the VET organisation in terms of reputational benefits, which will assist in attracting the support of employers (and potentially also entrepreneurial role models, and business support organisations).

In the United States, vocational education (termed career and technical education [CTE]) is essentially funded and managed at the state and local government level (through local educational agencies) and delivered through high schools, community or technical colleges, a (small) apprenticeship system and a large (but disconnected) business-based training system (UNEVOC—UNESCO 2014; National Governors' Association 2004). According to Brown (2003), a number of initiatives at the national level in the US have stimulated and supported initiatives at the state level. These include:

- web-based programs in entrepreneurship developed by various organisations⁷
- the Rural Entrepreneurship through Action Learning (REAL) program delivered through high schools and community or technical colleges (among others)
- the FastTrac program, developed by the Ewing Marion Kauffman Foundation (a leading entrepreneurship research and advocacy centre), available through many US colleges
- entrepreneurship curriculum guides for educators developed by the National Business Education Association.

In 2002 in the US the National Association for Community College Entrepreneurship was created with the ambitious objectives of promoting entrepreneurship and improving collaboration in entrepreneurship development among community colleges.⁸

Subsequent research (Hagan 2005, cited in Carducci et al. 2005) showed that over 60% of American community colleges offer credit-bearing entrepreneurship training, while Carducci et al.'s own survey (2005) found extensive community college involvement in the promotion of economic and workforce development via non-credit entrepreneurship and small business management education. A recent survey of entrepreneurship education at the state level (National Consortium for Entrepreneurship Education 2012) found that:

⁷ See, for example: <<http://cte.unt.edu/marketing/entrepreneurship>>.

⁸ <<http://www.nacce.com/>>.

- Most active states are including entrepreneurship competencies in state educational standards.
- Almost all colleges offer entrepreneurship courses.
- National funding support for entrepreneurship course development, 'national entrepreneurship week' and national entrepreneurship teaching conferences assist course development in states.
- Teacher capabilities and traditional approaches to teaching were limiting effectiveness.

In the European Union, the Entrepreneurship 2020 Action Plan, which puts entrepreneurship at the heart of the growth and business development agenda, is encouraging the Member States to 'ensure that the key competence "entrepreneurship" is embedded into curricula across primary, secondary, vocational, higher and adult education before the end of 2015' (European Commission 2013, p.7). However, a review carried out as background for the 2014 European Business Forum for Vocational Training found that EU countries varied widely in their approach to strategy development and implementation for entrepreneurship in VET:

Some have strategies dedicated to entrepreneurship education while others have developed entrepreneurship education through wider policies e.g. national curriculum frameworks; others are still in planning stage. Overall, the review found a wide variety in practice in terms of curriculum, teacher preparation and assessment.

(European Commission, Education and Culture 2014, p.15)

As discussed in European Commission, Education and Culture (2014), qualification structures and educational targets and practices are being reassessed in many European countries for their effectiveness in supporting:

- a closer match between vocational qualifications and work requirements
- changing occupations and tasks within them
- new skill requirements
- an emphasis on self-directed and problem-centred learning.

In the case of VET in the Netherlands, most of the four fields of competence that have been identified relate to what this report characterises as 'enterprise skills':

- *vocational methodical competences*: vocational content and specific activities, assignments and problems
- *organisational and strategic competences*: the ability to organise and plan tasks and to work in specific work and organisational environments
- *social, communicative, normative and cultural competences*: management of problems connected to working in groups and participation in the community of practice at the level of a team, a company or a profession
- *learning and shaping competences*: the contribution to one's own learning and development and the development and innovation of an organisation or profession (drawn from Onstenk 2005, pp.18–19).

The majority of European Union countries now include entrepreneurship in the national vocational education curricula. In some countries VET students encounter some elements of entrepreneurship education, while in others the exposure is minimal. According to a

European Commission report on entrepreneurship in VET (2009), this remaining gap is due a range of factors, including a lack of courses, low participation, inadequate involvement by business people, and particularly ineffective teaching – due to a lack of competency among teachers, related to a lack of both relevant experience and professional development.

According to Ruskovaara (2014, p.17), Finland now includes entrepreneurship in the curriculum for vocational education: 'according to the national curricula of vocational education and training, all vocational degrees contain a minimum of 5 study weeks of entrepreneurship education'.

The literature reveals that this is a period of experiment, learning and change for the vocational education systems in many countries (Schmidt 1999; Onstenk 2003). The Survey of Entrepreneurship Training in Higher Education in Europe conducted in 2008 by NIRAS Consultants for the European Commission noted that:

entrepreneurial education is still in its infancy in many of the institutions ... The study shows that entrepreneurial education is still immature in the sense that it is often person-driven and depends upon the efforts of individuals rather than a collective, strategic effort on the part of the HEI [Higher Education Institution] or national government (p.6)

In the member countries of the European Union, where enterprise or entrepreneurship have been introduced into the curricula for vocational education and training, the approach to skill development often includes both the broader enterprise skills and the narrower entrepreneurship skills for those intending to start a business (CEDEFOP 2011). The CEDEFOP (2011) and the OECD (2014) reports make clear that these developments can raise significant challenges for VET institutions in terms of clarifying a number of basic and interrelated questions on entrepreneurial skill development. These include:

- which VET students?
- what objectives?
- what course content?
- how to develop entrepreneurial skills?
- how to (learn to) develop the competencies to support such skill development?
- how to know if the skilling objectives are appropriate and are being achieved?
- what new relationships to develop (for example, with business support centres, incubators) to support entrepreneurial development (CEDEFOP 2011; OECD 2014; Fayolle & Gailly 2008).

Several valuable insights emerge from the survey carried out in 2013–14 as preparation for the 2014 European Forum on Vocational Training (ICF GHK, Danish Technological Institute & Technopolis 2014):

- Business groups were supportive of the initiatives in some countries to improve cooperation between VET and business and to involve business in the review of curricula. (One exemplar identified in the report is that of Tknika in the Basque region of Spain, which includes vocational training centres that offer training and problem-solving services to firms in the region).

- A large proportion of companies and associations point to VET teachers as the crucial link in promoting entrepreneurial skills in the workforce, but the majority of companies were of the view that most teachers lacked both an 'entrepreneurial culture' and relevant experience. In particular, teachers with experience in companies and who have networks with companies enable the use of real-world examples. Some respondents suggested teacher apprenticeships to allow VET teachers to gain relevant experience. One example is from Denmark, where a collaboration among four VET schools, an SME association and a university research centre helped to provide skill upgrading to SMEs while at the same time upgrading the competencies of the VET teachers, developed through close cooperation with SMEs.⁹
- Having interdisciplinary perspectives as a consequence of exposure to other disciplines/skill areas in VET is increasingly important, as effectiveness in the workplace increasingly involves working with those with other types of skill to solve problems and to innovate.
- The lack of appropriate learning materials for VET students in, for example, entrepreneurship and personal competencies, has in some cases been addressed through collaboration between VET and companies or, more often, industry associations, who also have a need for training materials or in-house programs. (One example is the UNIZO Foundation for Teaching and Entrepreneurship in Belgium.)

Defining the content of entrepreneurship courses in VET

What should be the skill and knowledge development objectives of entrepreneurship courses? The following discussion makes clear that there is no consensus on the answer to this question and that differences in terminology confuse the issue and reduce clarity, which is partly attributable to the evolving nature of entrepreneurship, with the OECD's Entrepreneurship Centre offering an explanation for this phenomenon. This OECD (2014, p.13) report also comments on the focus of the current curricula:

Over the years the concept of entrepreneurship has evolved from a subject matter focused on business creation into a broader concept that refers to an individual's ability to turn ideas into action and is commonly considered to be a key competence in the modern labour market:

- An emphasis that is broader than business and includes other contexts; particularly the interdisciplinary of different settings;
- Targeted at all students, regardless of discipline;
- Courses and programmes aim to develop both soft and hard skills, and particularly the combination of the two;
- Learning process is embedded in different contexts that are relevant for different disciplines; and,
- Outcomes seek to foster entrepreneurial behaviours, skills and mind-sets.

Many analysts emphasise the need to focus on a broad set of enterprise skills for all students of entrepreneurship (Frank 2007; Gorman, Hanlon & King 1997). At the 2014 European

⁹ See <<http://hverdagsinnovation.net/>>.

Business Forum for Vocational Training, considerable debate took place on the importance of ‘transversal skills’ – often termed ‘soft skills’ – which most researchers in the field would see as relevant to all areas of education and as key foundations for enterprise and entrepreneurship skills (European Commission, Education and Culture 2014; see box 1).

Those business groups supportive of a greater emphasis on these skills stressed the importance of skills supporting flexibility and the ability to learn-to-learn, while noting the difficulty of foreseeing what vocational competencies will be needed in the future.¹⁰ While there were different views on the importance of transversal skill development, most agreed that work-based learning has a key role in developing these skills (European Commission, Education and Culture 2014).

Box 1 Transversal skills

Transversal skills, also termed ‘soft skills’, ‘cross-cutting skills’ or just the specific skills in question (e.g. language skills, communication skills etc.) include a number of non-occupation-specific skills such as personal and organisational skills, including:

- application of knowledge
- attitudes and values at work
- language and communication
- social skills and competences
- thinking skills and competences.

Source: European Commission, Education and Culture (2014).

As part of efforts in the US to strengthen VET, a recent initiative by the National Association of State Directors of Career and Technical Education Consortium (NASDCTEC) sought to develop a Common Career Technical Core (CCTC). This core explicitly includes enterprise skills (UNEVOC–UNESCO 2014).

The Eurydice report of 2012 on entrepreneurship education in Europe integrated a range of elements into a broad framework (table 1) through which to pursue the ‘overall goal of giving students the attitudes, knowledge and skills through entrepreneurship education in order to act in an entrepreneurial way’ (Eurydice 2012, p.19), although the distinction between ‘enterprise skills’ and ‘entrepreneur skills’ is not clear in this report. However, the report recognises that the approach to, and the outcomes of, entrepreneurship education varies among European countries.

Business simulations, start-up weekends and mini-enterprises are used often used internationally in VET systems to provide students with realistic learning opportunities that allow them to learn how to think like an entrepreneur (OECD 2014, p.90).

10 A similar case is made and a similar set of core skills is identified in World Bank (2010) and in the case of the US in Achieve (2012).

Table 1 Broad framework for designing entrepreneurial education

Attitudes	Category 1	<i>Self-awareness and self-confidence</i> are the entrepreneurial attitudes which constitute the basis for all other aspects of entrepreneurship. They entail discovering and trusting in one's own abilities, which then allows individuals to turn their creative ideas into action. In many countries, these attitudes might be pursued as general education goals.
	Category 2	<i>Taking the initiative and risk taking, critical thinking, creativity and problem-solving</i> are also fundamental, but they are also specific attributes of an 'enterprising self'.
Knowledge	Category 1	<i>Knowledge of career opportunities</i> and the <i>world of work</i> are learning outcomes that are not exclusively related to entrepreneurship, but usually form part of students' general preparation for their future career choices. However, a sound knowledge of the nature of work and different types of work involve an understanding of what it is to be an entrepreneur. This knowledge also allows students to define and prepare their place in the world of work with a well-developed awareness of opportunities and constraints.
	Category 2	<i>Economic and financial literacy</i> , including knowledge of concepts and processes that can be applied to entrepreneurship.
	Category 3	<i>Knowledge of business organisation and processes</i> is specific knowledge of the environment in which entrepreneurship is often applied.
Skills	Category 1	<i>Communication, presentation and planning skills</i> , as well as <i>teamwork</i> , are transversal skills essential to entrepreneurs.
	Category 2	<i>Practical exploration of entrepreneurial opportunities</i> includes the stages of the business set-up process, including designing and implementing a business plan.

Source: Eurydice (2012); European Commission (2009).

The distinction between 'enterprise' and 'entrepreneurship' training is clear in OECD (2014), where two levels of entrepreneurship training are characterised: a first level based on 'awareness' and a second level targeted on those with entrepreneurial intent (table 2).

Table 2 Levels of entrepreneurship training

Level 1: Basic entrepreneurship training	
Objective	Develop an awareness about entrepreneurship and its potential as a career path.
Delivered by	Trainers and entrepreneurs.
Method	Classroom training, experiential learning, apprenticeships.
Outcome	Students may develop an interest in starting a business; increased employability.
Level 2: Skills and support for business creation and growth	
Objective	Deliver skills to start and develop a business.
Delivered by	Entrepreneurs, professional coaches, and mentors, trainers, incubation, start-up support services.
Method	In-depth training, experiential learning, coaching, mentoring, incubation, start-up support services.
Outcome	Students create their own businesses and increase their employability.

Source: OECD (2014).

Others have focused in greater detail on those elements more directly related to becoming an entrepreneur. For example, Tolentino (1998) argues that entrepreneurial competencies must extend to the skills needed for managing a business, including the 'traditional functions' – those associated with operational management, personnel and organisation, financial administration, marketing, financial management, and making a business plan. These include, planning, organising, leading and controlling and being an enabler, facilitator and coordinator, communicator and negotiator, change manager and internal consultant. Tolentino (1998) also emphasises that most firms today will have closer cooperation with suppliers and customers and face a dynamic business environment, where having an international perspective, understanding the value chains to which the business is linked, being alert to business and technology change, and developing new competencies have become more important. Both Gibb (1998) and Tolentino (1998) identify some of the key skills for 'proper' entrepreneurial competencies: recognising business opportunities; interpreting market information; having insight into customer needs; building relationships; and building an innovative organisation (table 3).

Table 3 Key skills for enterprise formation and development

Types of entrepreneurial skills	Specific elements
1. Competencies to recognise and analyse market opportunities	Handling risk, managing technical dimensions and understanding the market.
2. Competencies to communicate and persuade	The ability to relate to, communicate with, and persuade customers, clients, suppliers, competitors, service providers and other stakeholders in the business environment in order to understand their needs, expectations, apprehensions and requirements.
3. Networking	The ability to build linkages with businesses and other organisations for collaboration to achieve shared objectives and mutual learning – developing a ‘community of practice’.
4. Personal management skills/personal entrepreneurial behaviour	The ability to ‘live with daily insecurity’, learning effectively from business interactions, developing an effective learning organisation that remains entrepreneurial, maintaining a flexible strategic orientation and appropriate delegation.

Source: Onstenk (2003); Gibb (1998); Gielen, Hoeve & Nieuwenhuis (2003); Tolentino (1998).

How to develop entrepreneurial capabilities

What approaches are effective in developing enterprise and entrepreneurial skills?

Ruskovaara (2014), reviewing a wide range of prior studies, notes that, at least until recently, much of the development of entrepreneurship teaching was based on assumptions about how to develop the desired skills.

In a report published around the same time, the OECD argues that entrepreneurship is best learned by doing but also emphasises the need for context-specific teaching strategies:

This is particularly true for vocational training, which typically operates in close collaboration with industries and businesses. The practical notion is strengthened when external networks and sources of knowledge are intensively tied into the training. Entrepreneurial learning involves emphasis upon ‘how to’ and ‘who with’ and that some knowledge is offered on a ‘need to know’ basis ... literature on entrepreneurship training clearly highlights the need of active pedagogies, but on the other hand it acknowledges that methods and contents that work well in one context and audiences do not necessarily work equally well in other contexts ... (OECD 2014, p.22–3)

As noted earlier, the theme of the 2014 European Business Forum for Vocational Training was ‘Business and VET – Partners for Growth and Competitiveness’, with a focus on entrepreneurial skills. The final report from the forum highlights the relevance of real-world learning for effective entrepreneurship training:

Entrepreneurial learning should be based on real-world problems. It is important that the VET system provide authentic and genuine learning opportunities for the students, if they are to learn how to be creative and entrepreneurial. If tasks are based on real-world problems, VET students will learn how to come forward with workable solutions which bring genuine value to the local business community.

(European Commission, Education and Culture 2014, p.14)

In the specific case of entrepreneurship training in VET, Gibb (2009) argues that the ‘how to’ elements should be emphasised. Several VET schools have developed experience-based approaches to fostering entrepreneurial skill development. Box 2 gives a number of examples, as identified in the literature. The 2009 European Union report on entrepreneurship in vocational education proposes a similar approach to that suggested by the European Commission’s Education and Culture division, noted above:

Regardless of the vocational training area, the most effective way to teach entrepreneurship is to have students participate in practical projects and activities, in which learning by doing is emphasised and real experience with entrepreneurship is gained. Problem-driven and experience-oriented education is essential to fostering entrepreneurial mindsets and abilities (p.7)

Box 2 Examples of practical approaches to entrepreneurial learning

In Dutch vocational education ... an important trend is the emphasis in learning trajectories on actually and actively introducing students to the personal, entrepreneurial and managerial aspects of enterprising by participating in shorter or longer simulations, student competitions or mini-enterprises, as well as by contacts with real entrepreneurs, ranging from visits to enterprises and guest lectures (exemplary models) to actively undertaking assignments for or collaboration with (starting) entrepreneurs. Games and a competitive element are very stimulating for participants (Onstenk 2003, pp.85–6).

Projects like mini-companies facilitate the relationship between business and education institutions, achieve substantive impact and are easy to replicate. These projects do much to accelerate change and improve the quality of our education systems down the road (European Commission, Education and Culture 2014, p.15).

Business simulations, start-up weekends and mini-enterprises are used often used internationally in VET systems to provide students with realistic learning opportunities that allow them to learn how to think like an entrepreneur (OECD 2014, p.90).

The survey conducted in preparation for the European Business Forum for Vocational Training showed that some VET schools have a 'learning company' approach, whereby students are supported to establish a company for the purpose of learning by working through all of the stages involved (ICF GHK, Danish Technological Institute & Technopolis 2014). Hietanen and Järvi (2015) emphasise the key role of reflection in entrepreneurial learning and hence on the role of experience as a foundation for such reflection. They argue that this has direct implications for the role of the teacher in entrepreneurship skill development (table 4).

There is continuing debate over what particular skills to develop (entrepreneurial or enterprising), for which groups of students and how best to do that.

Table 4 Environments that facilitate entrepreneurial learning

Elements in the entrepreneurial learning process	Teachers' arrangements in vocational education
Discovering opportunities	Exploiting formal and informal environments, as well as outside the school context: in real business life
Creating opportunities	For business development
Decision-making	Joint decisions for business through creative problem-solving and innovative thinking
Reflection	For, in and on action
Knowledge management	New information alongside earlier acquired information for action
Competence management	Exploiting new experiences and learning about them, applying achieved skills and knowledge to new situations.

Source: Hietanen & Järvi (2015).

Summary

In many countries, the past decade has been a period of experiment, learning and change for vocational education systems. There is a widespread recognition that education must contribute to preparing students for a future of greater change in economies, workplaces and skill requirements. In such a context, it is increasingly recognised that an objective of education should be to enable students to be active participants in change, seeking opportunity for their organisation and themselves through initiative. In short, an explicit objective of tertiary education in most developed countries, expressed in strategy documents and curricula guides, is now to develop in students an entrepreneurial mindset and enterprise skills.

However, there is continuing debate over what particular skills (entrepreneurial or enterprising) to develop, for which groups of students and how best to do that. Uncertainty over learning objectives, and limited evaluation of alternative learning approaches, has slowed the implementation of new programs. In many cases, a lack of suitably trained teachers with relevant experience has also reduced the effectiveness of new programs in VET organisations.

These debates and initiatives are of direct relevance to VET in Australia. While the approach used in each country is shaped by its circumstances and the structure of its education system, there is a wealth of relevant, and increasingly evaluated, experience on which to draw.



Entrepreneurial ecosystems

Some regions have demonstrated sustained high levels of new-enterprise formation and growth.

Introduction

Over the past 20 years the regional level has become an increasingly important locus for analysis and strategy development for most areas of public policy from industrial development to education.¹¹ In relation to entrepreneurship, some regions clearly provide environments that have sustained high levels of new-enterprise formation and growth and this has led to research aiming to identify the characteristics that enable some regions to 'out-perform' in this regard.

This section draws on international research to identify the characteristics of a region that supports entrepreneurship. The purpose of this discussion is to better understand how VET involvement in entrepreneurship can strengthen these regional characteristics and how VET providers can build relationships with other local actors in order to improve entrepreneurship development within VET. Like all organisations, VET providers also need to learn how to be more innovative and enterprising. Interaction with other innovative organisations and with entrepreneurs will contribute to cultural and organisational change in VET.

Research has led to the characterisation of 'entrepreneurial ecosystems'; that is, the formal and informal institutions and relationships that facilitate access to such entrepreneurship-relevant resources as information, finance, reputation and specific knowledge (Carvalho, Costa & Dominginhos 2010; Isenberg 2011; Krueger 2012). Such ecosystems may include formal organisations such as incubators, business 'angels' and other venture capital providers, and research centres, but these are far more effective when they operate in a plasma of informal trust-based reciprocal relationships. These networks and relationships not only facilitate access to resources (often outside market-based transactions) but they also help to ensure that learning (from prior business experiments, that is, innovative entrepreneurship) is diffused and available to new entrepreneurs. This recycling of experience-based knowledge contributes to lowering the risk and improving the quality of new business experiments.

Daniel Isenberg, one of the earliest of these researchers, saw the combination and balance of elements in an entrepreneurial ecosystem (rather than a prescriptive list of essential elements) as vital for performance – combinations that may differ from region to region (Isenberg 2010, 2011). Most researchers in this field emphasise the slow and organic processes by which entrepreneurial ecosystems are developed – an important reminder for policy that aims to develop, or relate to, specific entrepreneurial ecosystems (Erasmus Multilateral Projects 2013).

¹¹ Some earlier discussions of VET at the regional level include Kearns, Bowman & Garlick (2008) and Garlick, Taylor & Plummer (2007).

Key components of an entrepreneurial ecosystem

Several frameworks have been developed to identify and characterise the elements of entrepreneurial ecosystems. Figure 1 reproduces the framework developed by Isenberg, which takes a wide systems perspective.

Figure 1 Domains of an entrepreneurial ecosystem



Source: Isenberg (2010, 2011).

A complementary approach, which is more useful for assessment of the development and performance of these 'ecosystems' is that of Gnyawali and Fogel (1994), who approach the characterisation of entrepreneurial ecosystems by emphasising that the start-up process is embedded in a complex set of environmental factors. They see these factors in terms of the way they impinge on entrepreneurial decisions regarding opportunity assessment and venture creation:

- existence of entrepreneurial opportunity
- recognition of opportunity and confidence to act (the propensity to enterprise)
- entrepreneur's economic and technological knowledge (the ability to enterprise)
- the availability of funding and other support (the likelihood of enterprise making).

The World Economic Forum commissioned a major review of approaches to characterising and assessing entrepreneurial ecosystems (World Economic Forum 2013). The study found that, across countries and sectors, four factors were consistently identified as critical for growth: accessible market opportunity; top management; human resources; and funding and finance. The major growth challenges identified were almost identical factors: funding and

finance; human resources; market opportunity; and government and regulatory (World Economic Forum 2013, pp.17–18). The characterisation of entrepreneurial ecosystems based on the study is shown in table 5.

Table 5 Components of an entrepreneurial ecosystem

Pillars of the ecosystem	Components of pillars
Accessible markets	<i>Domestic market.</i> large companies as customers; small/medium companies as customers; governments as customers. <i>Foreign market.</i> large companies as customers; small/medium companies as customers; governments as customers.
Funding and finance	Friends and family; angel investors; private equity venture capital; access to debt.
Human capital workforce	Management talent; technical talent; entrepreneurial company; experience outsourcing; availability access to immigrant workforce.
Regulatory framework and infrastructure	Ease of starting a business; tax incentives; business-friendly legislation/policies; access to basic infrastructure (e.g. water, electricity); access to telecommunications/broadband; access to transport.
Education and training	Available workforce with pre-university education; available workforce with university education; entrepreneur-specific training.
Mentors, advisors support systems	Mentors/advisors; professional services; incubators/accelerators; network of entrepreneurial peers.
Major universities as catalysts	Major universities promoting a culture of respect for entrepreneurship; major universities playing a key role in idea-formation for new companies; major universities playing a key role in providing graduates for new companies.
Cultural support	Tolerance of risk and failure; preference for self-employment; success stories/role models; research culture positive image of entrepreneurship; celebration of innovation.

Source: World Economic Forum (2013).

This brief review has shown that there are a number of frameworks designed to guide the characterisation and assessment of entrepreneurial ecosystem. A comprehensive and systematic assessment of a specific entrepreneurial ecosystem is a substantial undertaking (therefore beyond the scope of this study) which would focus on aspects of the human capital/education and training component, but also touch on the support and policy components of an entrepreneurial ecosystem.

Evolution of entrepreneurial ecosystems

This review has noted that a focus on the regional level has become an important dimension of research on innovation and entrepreneurship. The research in these areas has also led to an emphasis on the extent of the complex interactions and interdependencies among the factors that characterise high-performing regions. As these factors are not independent in their development or impacts, they are often seen as elements of systems; hence, the development of frameworks for ‘clusters’, ‘regional innovation systems’ and ‘entrepreneurial ecosystems’. These perspectives have had a profound influence on innovation and entrepreneurship policy, although not always positively. Their influence can be counterproductive when government organisations, through policy, embark on efforts to create innovation or entrepreneurship ‘systems’ over a short period of time. The discussion in this and the following sub-section is designed to emphasise the need to develop thoughtful and considered policy in this area.

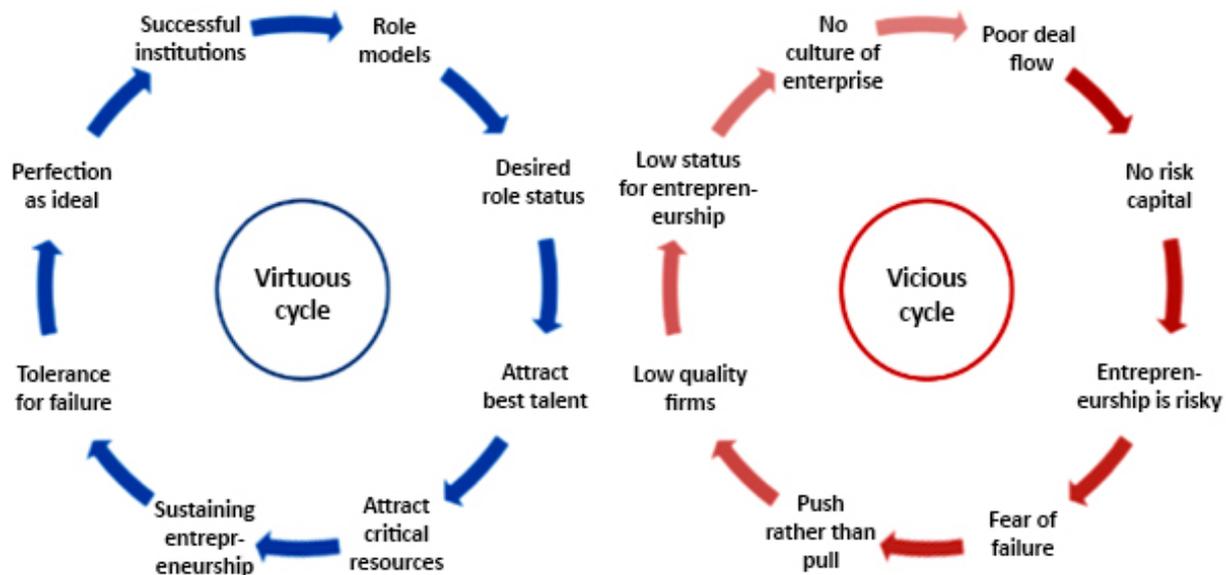
The World Economic Forum (2013) report on entrepreneurial ecosystems identifies some of the features that shape the evolution of these systems. It stresses that the development of strong systems has taken decades. While a small number of people acting as network

leaders and organisation builders have often played critical roles, formal infrastructure, such as incubators, accelerators and investment funds, can amplify positive dynamics, but do not create the networks and informal relationships that are the core of these ecosystems. The World Economic Forum report emphasises the key role of feedback from successful entrepreneurs who can leverage their experience and their networks to support new entrepreneurs and, hence, the importance of having them remain engaged in the ecosystem as mentors, advisers and investors. Successful entrepreneurs therefore play critical roles through:

- inspiration: inspiring other individuals to become entrepreneurs
- founder crucible: attracting and developing employees who subsequently establish other companies
- employee crucible: attracting and developing employees who subsequently become employees of subsequent early-stage companies
- investment source: using acquired wealth to invest in subsequent new entrepreneurial ventures
- mentor role: providing key support such as advice, encouragement and access to a network (World Economic Forum 2013, p.22).

Venkataraman (2004) has a similar perspective, in that he emphasises the role of positive feedbacks (figure 2). Again, this perspective highlights the importance, in terms of developing the capacity to inspire, develop and support entrepreneurship, of participation by experienced entrepreneurs in the regional entrepreneurship ecosystem.

Figure 2 Virtuous and vicious circles in fostering regional entrepreneurship

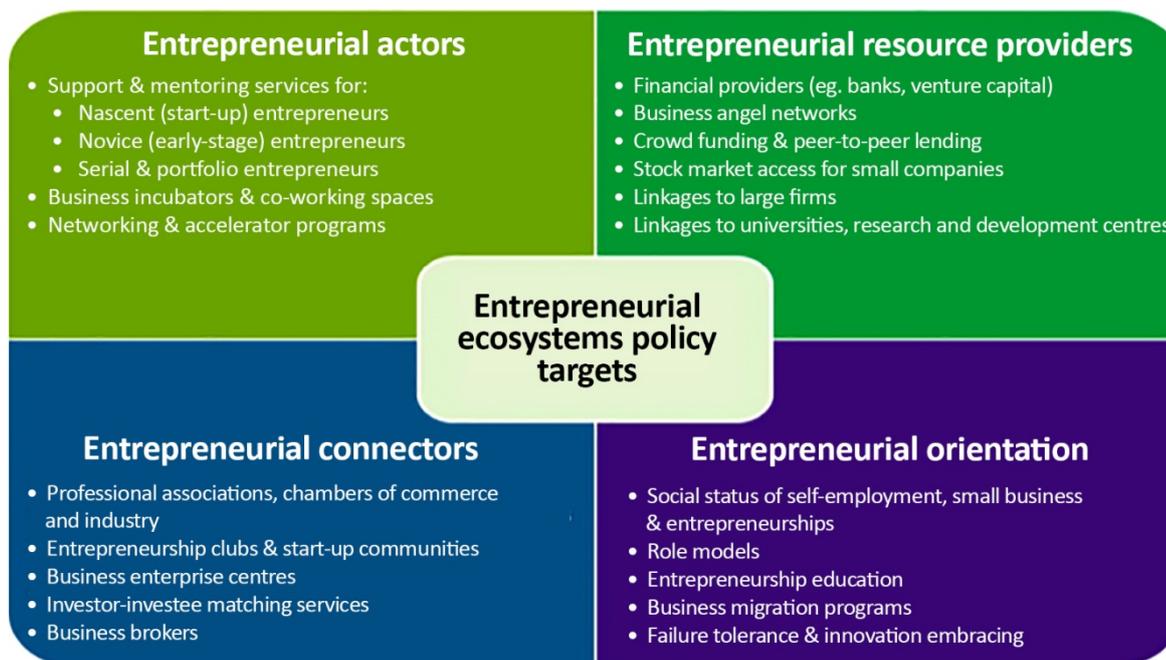


Source: Venkataraman (2004).

The role of policy in developing entrepreneurial ecosystems

Mason and Brown (2014) have drawn on assessments of the history of entrepreneurial ecosystems development to propose several principles for policy support. They argue that the forms of assistance needed to foster entrepreneurial firms (typically 'time-sensitive, dynamic, strategically focused and peer-based') are quite different from those needed to support SMEs in general. This leads them to stress the importance of policy at a regional level; that is, responsive to the specific needs of the region (figure 3), a point also stressed by Isenberg (2010).

Figure 3 Policy points of focus for entrepreneurial ecosystems



Source: Mazzarol (2014), p.13.

Mazzarol (2014) also assessed the role for government policy in the formation and growth of entrepreneurial ecosystems. He emphasises that focusing on the 'Silicon Valley Business Model', with the goal of replicating Silicon Valley, not only risks failure but also risks redirecting critical resources away from less high-tech but more competitive sectors (Hirsch-Kreinsen, Hahn & Jacobsen 2008; Reboud, Mazzarol & Soutar 2014).

VET in entrepreneurial ecosystems

Developing the role of VET in entrepreneurial ecosystems

No studies that comprehensively address the role of VET organisations in entrepreneurial ecosystems have been identified through this study. In the Australian context, one relevant study, based on reviews of 11 Australian regions, concluded that the contribution of VET to regional development could be strengthened by initiatives designed to more effectively develop enterprising skills and through stronger engagement with the region to strengthen expertise (Garlick, Taylor & Plummer 2007, p.10):

We believe that fostering an enterprising culture on a broad front is the way to realise regional growth and competitiveness objectives. VET courses designed to develop enterprising skills need to be linked closely to key regional attributes, strategies and investment and be comprehensive across VET programs.

A subsequent study by Kearns, Bowman and Garlick (2008) addressed the broad issue of the role of VET in regional development.¹² This review of the functions that VET can perform in regional development concluded that its potentially important social and economic role in regional development is only partially realised. The review found limited evidence that VET organisations were contributing to 'enterprising human capital' and made the point that comprehensive regional development strategies provide a framework for VET organisations in a region to develop complementary strategies and relationships. The review's conclusions (Kearns, Bowman & Garlick 2008, p.9) are highly relevant to this study:

Overall, we have concluded that the role of the VET sector in contributing to sustainable regional development should be strengthened in ways that foster a more dynamic two-way interaction between VET and regional development. This will require broadening VET's role in serving communities and regions in the light of shifts in the socioeconomic context of VET. This rethinking of the VET paradigm and its role in serving communities and regions will require:

- enhancing flexibility in the sector's response to the full range of learning and skill needs in community and regional development, including the small business sector and small and underserved communities
- encouraging innovation and enterprise in VET institutions, especially in the technical and further education (TAFE) sector as the public provider
- encouraging and supporting community and regional frameworks that connect and extend VET partnerships in strategic ways and which foster ongoing dialogue and interaction.

In short, both of these reports argue that VET has a role to play in developing the capabilities, networks and institutions that will support enterprise in a region.

Similarly, one of the recommendations from the 2014 European Business Forum on Vocational Education was that: 'VET schools should be embedded in the local entrepreneurship eco-system', with the report of the workshop developing this perspective further:

If VET schools are to become important players in the local or regional business and innovation system, teachers need to become more involved in the local business community and have a better insight in the local companies than is currently the case in many countries. Not only will this insight improve teachers' understanding of current and future skill needs but will also allow them to understand how entrepreneurial attitudes and skills are applied in the real world. More direct engagement of teachers into the local business environment was considered critical to building teacher capacity with company visits and internships for teachers in companies ...

(European Commission, Education and Culture 2014, p.14)

It is important to note that some researchers believe the VET sector in Australia lacks a strategic and systemic approach to addressing the many challenges faced in strengthening

12 A regional perspective on human resource development has become increasingly influential in considering the role of education, training and research organisations. The underlying frameworks, based on the 'learning region' and 'regional innovation systems' approaches, share many of the concepts underlying the 'entrepreneurial ecosystem' perspective (OECD 1997; CEDEFOP 2003).

its role in developing a workforce to suit a more turbulent, innovative and entrepreneurial economy. Some consider that a series of policy and regulatory changes over the past 20 years by Commonwealth and state governments have resulted in a sector that has been forced to focus on short-term adjustment. In a 2014 submission to the Senate Inquiry into Innovation and Creativity: Workforce for the New Economy, Clare Field and Associates (2016, p.6) argued that: 'The development and implementation of entrepreneurship skills for VET students (which can be integrated into learning across a range of industry areas) is crucial', although the submission claims that: 'VET is hampered in its ability to foster entrepreneurship and engage its learners in entrepreneurship programs'.

Participation of local business and entrepreneurs

In relation to a stronger role for VET in the development of entrepreneurial skills, several studies have emphasised that VET organisations should build relationships with business, entrepreneurs and other entrepreneurship organisations in their region. For example, the Aspen Youth Entrepreneurship Strategy Group (2008, p.19), argues that:

Effective Entrepreneurship Education programs engage local entrepreneurs as mentors, coaches, speakers and role models. It's not enough to simply have teachers teaching a new class; new partnerships will be required. Partnerships with local business organizations, such as Chambers of Commerce, Small Business Development Centers, Entrepreneurs' Organization (EO) or local civic clubs, such as a Rotary, are also an integral component of Entrepreneurship Education.

The survey conducted for the 2014 European Forum on Vocational Training concluded that business–VET collaboration should be 'built-into' the VET system (as it often is in dual VET systems), but to be effective this required the support of industry associations, regional organisations and regional government (ICF GHK, Danish Technological Institute & Technopolis 2014). This issue also emerges as one important conclusion of several recent studies (NIRAS Consultants 2008; European Commission 2012; OECD 2014; CEDEFOP 2011).

The OECD (2014, p.16), for their part, makes the point that the relationship between VET and industry/business needs to be strengthened:

Training centres will also need to facilitate access to more intensive business development supports such as coaching and mentoring. In many cases these supports are not offered directly by trainers and training centres, but are instead offered by the business community or other support organisations. This will require strengthening linkages between the VET centres and the business community so that students and trainers are aware of available supports, allowing trainers to refer students to appropriate support services at the appropriate time.

In relation to the Australian context, Kearns, Bowman and Garlick (2008) found that, while some VET providers had been developing relationships with businesses in their region, these partnerships were not usually initiated by VET organisations.

However, several recent studies have emphasised the potential benefits of closer collaboration for both business and vocational education, but these reports recognise that for many small firms and VET schools this presents significant challenges, not least of those is that, for many small and micro firms, the transaction costs of collaboration and participation in apprenticeship programs (and other forms of work-based learning) are too high. In recognition of these challenges, the report of the European Business Forum on

Vocational Education suggested that regional governments and vocational education providers should provide services to SMEs in order to reduce these transaction costs, build a stronger dialogue and facilitate cooperation (European Commission, Education and Culture 2014, pp.20–1; ICF GHK, Danish Technological Institute & Technopolis 2014, p.58). Again, the specific characteristics of a region must shape the approaches.

The role and development of VET teachers

An important conclusion of several major studies is that a lack of relevant experience and training among VET teachers is an impediment to the development and quality of entrepreneurship programs. In 2008, NIRAS Consultants, under the auspices of the European Commission, conducted a survey of entrepreneurship training in Europe. Their report found that VET teachers may possess theoretical knowledge on the topic of entrepreneurship but had little practical experience in the field:

one of the major differences and areas for improvement is related to the experience of entrepreneurial trainers. It does not seem to be very widespread that staff teaching entrepreneurship has personal experience with entrepreneurship. Consequently, many students are being taught by trainers that have a theoretical knowledge about entrepreneurship, but lack the practical knowledge. However, since entrepreneurship to a large degree is a practical, hands-on subject, the teaching of it will likely be improved if the trainers have their own practical entrepreneurial experience that they can take advantage of...

(p.6)

A later European Commission report (2014, pp.14–15), one a series of reviews into skills and competences for entrepreneurship, also identified that teachers lacked entrepreneurial skills:

In the two workshops, the participants discussed what an increased focus on entrepreneurial skills and attitudes implies for the role of teachers vis-à-vis students ... that in the future, teachers ... start seeing themselves more as facilitators for the students' learning process ... teachers need to develop their ability to coach students during periods when their learning venue is outside. They also need to be more entrepreneurial themselves by collaborating with business and providing an entrepreneurial environment for staff and students with entrepreneurship permeating all learning activities.

NIRAS Consultants (2008, p.6) suggested in their report that, to ensure students were exposed to an entrepreneurial environment, entrepreneurs themselves could be used in the classroom:

The use of entrepreneurs and/or former students as teachers ... is one of the ways in which the institution ensures that the entrepreneurial teaching is relevant and linked to the outside community. The networks that the institutions build with their stakeholders – regional or national government, agencies, private companies, consultancy service providers etc. – vary slightly among the institutions. But the tendency is clear: teaching entrepreneurship is not seen as an activity that is designed to take place in the confinement of academia. There are slight differences in the extent to which the network is used: some institutions might have developed links to their stakeholders, but when it comes to developing these links into collaboration where the stakeholders make an actual contribution to entrepreneurial education, this is not done by all to the same degree.

In a similar vein, Ruskovaara et al. (2014) report on a study which found that VET teachers were much more likely to network with local firms and other organisations if they themselves had business experience, but also if they had been involved in the planning and development of the school's entrepreneurship programs.

The European Commission's 1999 report from the expert group on entrepreneurship in VET, the 2014 report of the VET–business survey (ICF GHK, Danish Technological Institute & Technopolis 2014) and the OECD report on entrepreneurship development in vocational education in Tunisia (OECD 2014) all stress the need to improve the development of competencies of entrepreneurship teachers in VET, and perhaps VET teachers more generally:

The principal challenge in exploiting entrepreneurship training further in VET relates to the trainers' understanding of entrepreneurship, their attitude towards it and their capabilities to teach it. (European Commission 2009, cited in OECD 2014, p.57)

All of these reports note that few countries have systematic approaches to such training, which prompts these reports to stress the need for a comprehensive entrepreneurship development strategy for VET, established through a steering or advisory committee with broad participation from government and business.

It is no different in Australia. The articles compiled and published by Mitchell (2007) provide practical examples within a professional development guide aimed at helping those working in the VET sector to become more innovative and entrepreneurial.



Case study: entrepreneurship and VET in the ACT

Introduction – approach and methods

The three earlier sections of this report argued that developing enterprise and/or entrepreneurship skills in students constitute an unavoidable challenge for VET organisations and policy-makers the world over, and Australia is no exception. In Australia, this will require substantial investment and effort to develop the capabilities to address that challenge, while the responses of VET organisations in particular must involve building relationships with organisations in their region, including in the entrepreneurial ecosystem, and also the development of location-specific strategies.

This case study focuses on one region, the Australian Capital Territory. It is concerned with the development and role of the entrepreneurial ecosystem, and particularly the extent to which the VET system in the ACT contributes to the skills used by entrepreneurs in the early stages of forming new ventures. The discussion is organised into four sub-sections:

- The characteristics of the ACT are described, including the structure and dynamics (entries and exits, or births and deaths) of firms of different sizes and in different industries. The main features of the VET system in the ACT are also described. This section is included to illustrate the importance of the particular characteristics of regions, these characteristics being those that necessarily shape the strategies of VET organisations.
- The main organisational characteristics of the ACT entrepreneurial ecosystem are described. This discussion illustrates the diverse actors of such an ecosystem, even in a small region like the ACT, and hence indicates the challenges that VET organisations face in developing effective engagement.
- The characteristics of the target start-up group are described. This discussion also touches on the methodological challenges involved in developing the database of approximately 100 new ventures formed over the past 25 or more years.
- The final section focuses on the small proportion of these new ventures in which the individual, or a member of the founding team, had a VET qualification, and then looks at the role of the VET system. It provides some vignettes outlining the experience of these founders.

The design of this empirical component of the study required decisions about scope and methods, and these have shaped the findings and their interpretation. The three key parameters are set out below and the implications of the research criteria are discussed.

▪ Region

The case study region is the Australian Capital Territory, a small city-state with its own VET system. Some adjacent areas, including the city of Queanbeyan (population 42 000), are closely linked to the ACT economy and are essentially part of the region in most practical respects. The ACT displays characteristics that mean it is neither a typical urban nor a rural region: it is relatively compact and research-intensive and has a history of significant start-ups and a strengthening entrepreneurial ecosystem supported by the

regional government. This suggests the need for caution in generalising the findings from this case study to other regions.

- **VET providers**

The VET system in the ACT includes both public sector providers (Canberra Institute of Technology [CIT]) and large number of more specialist private providers. As CIT is the major provider of VET in the ACT, this study focused largely on that organisation. It proved not possible to obtain useful and comprehensive information on the role (for example, numbers of students, courses offered) of the different VET providers in the ACT. Consequently, it was beyond the scope of the study to assemble this information and to contact a wider range of providers.

- **New ventures**

The case study focuses on firms formed in the ACT, particularly over the past 25 years, but its scope is confined to a sub-set of these: those ventures formed with the ambition of addressing a market (national and international) beyond the ACT. As discussed in the first section of the review, these types of firms have the potential to generate significant net employment growth and to drive structural change. The identification of the new ventures that formed the target group for this analysis is discussed further in this report.

The selection criteria exclude the majority of new firms, those that, in industries such as food service, hairdressing and building and consulting, essentially replicate a proven business model and/or have little intention or potential to 'scale up' and grow. This focus does not imply that such largely 'replicative' firms are not important or that they are not relevant to the VET role in entrepreneurship. They do generate employment, although very little net employment growth, and establish rewarding businesses and lifestyles for the individuals involved. They may also provide goods and services of significant value to the region or to particular social groups in the region. Some types of new firms may also generate significant social value by addressing the goals of inclusion, equity and environmental sustainability. There were two reasons for excluding these firms from the survey: first, the founders of these firms rarely interact with the entrepreneurial ecosystem, the main actors in which have little interest in such firms; second, in view of the number and diversity of such firms, their limited average longevity and the lack of information sources to identify them, it was substantially beyond the scope of this study to attempt to identify, contact and survey any reasonable sample of these firms.

The regional context

Characteristics of the Australian Capital Territory

As noted, the ACT is an atypical region. The public sector, through the public administration offices of the Commonwealth Government, plays a relatively large role, and the presence of several Commonwealth Scientific and Industrial Research Organisation (CSIRO) Divisions and the Australian National University leads to a relatively high research intensity.

The ACT has a population of about 375 000, but if closely linked neighbouring regions are included, the population exceeds 450 000. The average level of degree qualification in the ACT is higher than the national average. In the ACT 4.5% of the population have a postgraduate degree compared with 1.8% across Australia. On average, ACT residents have

higher incomes than the Australian average. Due to the nature of the labour market, the ACT has the highest rates of cross-border migration of any state (Access Economics 2008).

The structure of the ACT economy is also atypical (table 6). It has a population of about 25 000 firms and is strongly services-based. Over a third of the economy falls into the category of 'public administration and safety' (vastly higher than the national average), while 'professional, scientific and technical services' and 'education and training' have significantly larger shares of the economy than the Australian average. On the other hand, 'retail' and 'wholesale' trade, 'manufacturing', 'mining' and 'agriculture, forestry and fishing' are much more limited than in the other states.

Table 6 Structure of the ACT economy

Sectors	Sectoral distribution of total factor income %	
	ACT	Australia
Public administration and safety (ex. defence and public order)	34.7	6.1
Construction	5.2	9.1
Professional, scientific and technical services	10.3	7.0
Education and training	8.6	5.5
Health care and social assistance	7.4	7.6
Financial and insurance services	4.4	10.1
Retail trade	3.3	5.2
Accommodation and food services	3.9	2.8
Electricity, gas, water and waste services	3.7	3.2
Information media and telecommunications	2.6	3.4
Transport, postal and warehousing	3.4	5.4
Other services	2.3	2.2
Arts and recreation	2.3	0.9
Administrative and support	1.6	3.1
Wholesale	1.6	4.8
Manufacturing	1.2	7.3
Mining	-	10.2
Agriculture, forestry and fishing	-	2.6

Source: St George Bank (2016).

The structure of the ACT labour market reflects this economic structure. Knowledge-intensive services (administration, defence, cultural services, property and business services, education) are all more important in the ACT than the national average, and most other employment categories are at lower levels than the national average.

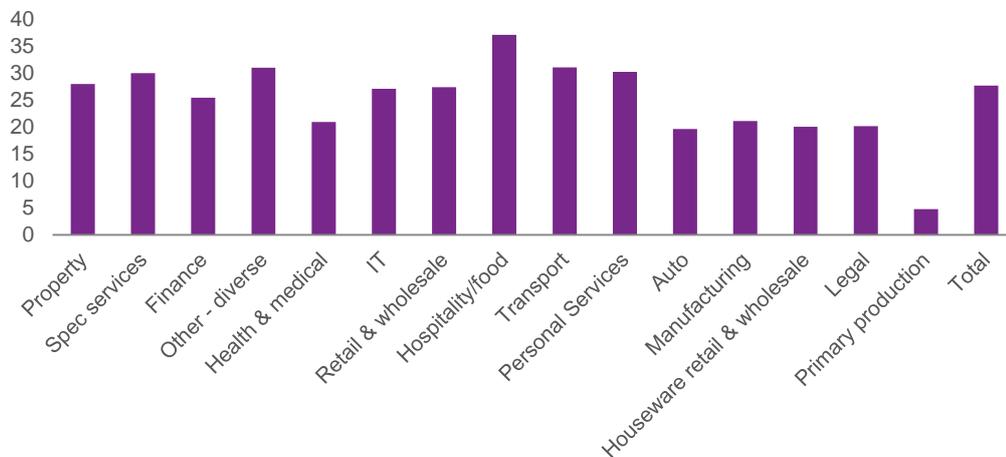
Structure and dynamics of the ACT business sector, 2015

Australian Bureau of Statistics (ABS) data give firm numbers, entries and exits by industry category and size of firms, for each state and territory, for the four years from 2011 to 2015.¹³ Over the four years, 2011–15, each year about 320 new firms in the 1–19 employee size range and almost 600 firms without employees were formed and entered the business sector in the ACT. A similar number exited the sector each year. The level of 'churn' in

13 The categories used for this analysis were formed by aggregating the many detailed industry categories in the ABS data into 15 broader categories.

each industry sector is indicated by the numbers of entrants and exits from the sector over time, as shown in figure 4.

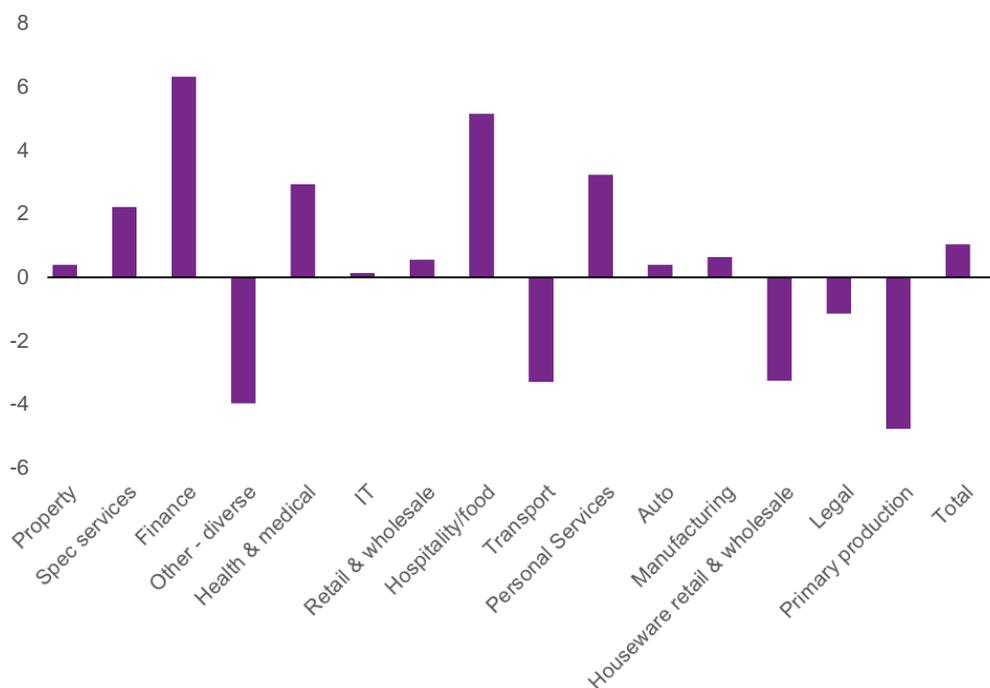
Figure 4 Churn rate of ACT firms: 2011–15 (entry and exit)/total in sector (%)



Source: Calculated from ABS series 81650 Counts of Australian Businesses, including entries and exits, 2011–15.

Across the four years, over 25% of firms in the ACT either entered or exited an industry. In the case of the hospitality and food service sector, well over a third of firms entered or exited the sector. Over those four years, 2011–15, some sectors had more entrants than exits and others had more exits than entrants, leading to modest structural change. The data show that the number of firms in the finance and hospitality and food service sectors grew by about five to six per cent over the four years (figure 5).

Figure 5 Net change in the number of firms in each sector (%)

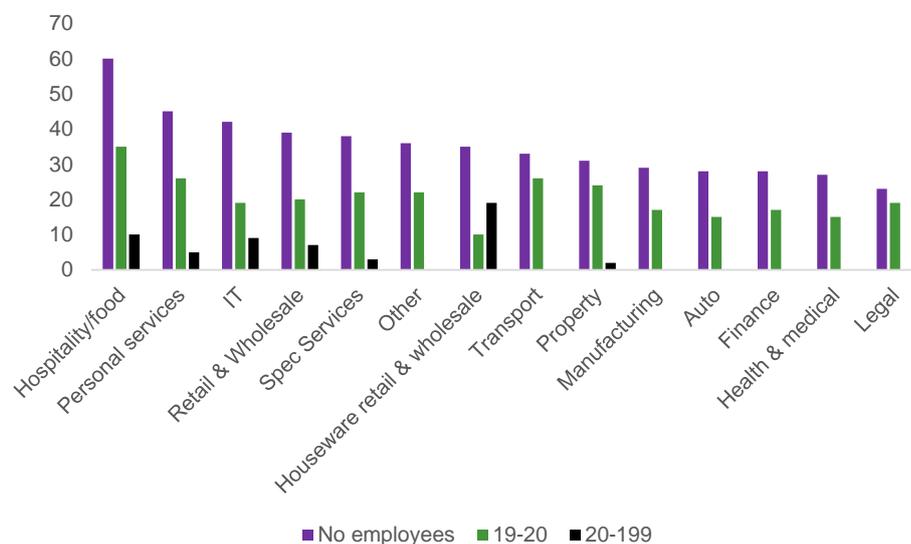


Source: ABS series 81650, Counts of Australian businesses, including entries and exits, 2011–15.

As would be expected, the rate of churn is higher among smaller firms. Figure 6 shows the level of churn in the ACT for each sector and by size of firm.

It is clear that the level of churn is highest among the firms without employees, and among the small firms (1–19 employees) and in the hospitality/food, transport, personal services and property sectors. Overall, a third of firms without employees and over 20% of the small firms (1–19 employees) in the ACT entered or exited the industry over the four-year period. Several of these high-churn sectors (for example, hospitality and food service, personal services, IT and property) are likely to include many firms formed or staffed by VET graduates. In developing a greater role for the ACT VET system in entrepreneurship, it would potentially be useful to know more about the processes of firm formation and development in these sectors. However, in view of the numbers involved and the challenges of identifying firms, this was beyond the scope and outside the objectives of this study.

Figure 6 Rates of ‘churn’ by ‘sector’ and firm size in the ACT, 2011–15 (%)



Source: Calculated from ABS series 81650, Counts of Australian businesses, including entries and exits, 2011–15, with sectoral groupings by the author.

Characteristics of ACT start-ups: 1990–2016 and the role of VET graduates

The objective of this part of the study was to assess the role of VET graduates in start-ups in the ACT. This was far from straightforward, and involved the following steps:

- *Identifying start-ups:* as noted above, the identification of start-ups focused on those with an ambition to grow and to address markets beyond the ACT; that is, those with a scalable business model and a strategic intent to grow. As no comprehensive database of start-ups over the past 20 or so years existed, developing a database required extensive networking. One published study had identified about 20 high-performance ACT firms (Dawson 2014), but focused on those that were based on public sector research. Networking involved the Innovation, Trade and Investment Office of the ACT Government, the staff of the CBR Innovation Network (CBRIN), the Lighthouse Business Innovation Centre, the Southern Region and Canberra Business Enterprise Centre and several individuals with long experience of start-ups in the ACT and who often act as mentors to new firms. With the partial exception of the Academy of Interactive

Entertainment, contact with VET providers did not lead to useful information on start-ups. This process led to the identification of over 100 start-ups. Most of these are in existence today, but some have been acquired by larger firms and some have failed and closed.

Around 20% of start-up founders had a VET qualification.

- *Identifying founders and their backgrounds:* this step drew on the same networks and sources as above, but also on press reports, information in the lists of awards (for example, by the Canberra Business Council), social media and internet searches. In several cases direct contact with the firms or the founders, through LinkedIn for example, was necessary to confirm founders and their background. Within the scope of the project it was only possible to identify the founders and their backgrounds for 97 of the start-ups.
- *Exploring the process of firm formation:* in a small proportion of the start-ups the founders or one or more members of the founding team did have a VET qualification. In these cases, an attempt was made to contact each of these individuals to ask about the process of firm formation, the source of the skills and knowledge used for their entrepreneurship, and the sources of advice and support they drew on.

This overall process was time-consuming and would be difficult to replicate in a larger, less-contained ecosystem without the active participation of most relevant incubators and support organisations; even then, many firms are formed with little involvement by such third parties.

The database of ACT start-ups is set out in appendix A of this report. It shows the backgrounds of the founders of these almost 100 new ventures. The main characteristics of these start-ups, based on this database, are summarised in tables 7 and 8.

Table 7 Characteristics of ACT start-ups, 1990–2016, number of start-ups

Numbers	Start-ups in period	Based on IT	With VET graduates*	Targeting public sector markets	Formed by teams
Before 1990	7	5	0	4	4
1990–99	15	7	3	7	7
2000–09	31	15	6	9	13
2010–16	45	29	10	5	24

* This includes individuals with a VET qualification or a university degree and a VET qualification, as the sole founder or as a team member. Most often these were individuals who had gained considerable professional experience after completing vocational education or had a degree and a vocational education qualification.

Source: Author's database – see appendix A.

Table 8 Characteristics of ACT start-ups, 1990–2016, proportion of the 97 start-ups (%)

Percentages	Based on IT	With VET graduates+	Targeting public sector markets	Formed by teams
Before 1990	71	0	57	57
1990–99	47	20	47	47
2000–09	48	19	29	42
2010–16	64	22	11	53

*This includes individuals with a VET qualification or a university degree and a VET qualification, as the sole founder or as a team member. Most often these were individuals who had gained considerable professional experience after completing vocational education or had a degree and a vocational education qualification.

Source: Author's database – see appendix A.

Most founders with a VET qualification also had a university degree or substantial experience in the workforce.

While reliable information prior to 1990 is not available, the available data on start-ups over the period from 1990 suggest a strong increase in the number of start-ups each year. Taking into account that the data for the most recent period do not cover a full decade, the number has roughly doubled each decade, suggesting a strong increase in entrepreneurial activity.

Overall, about half of the firms were formed by teams – a proportion that has remained fairly constant over time. In most cases the teams involved university graduates who had considerable professional experience after graduation. However, over the past several years the proportion of start-ups formed by graduates with little or no professional experience after graduation has increased. These start-ups are less likely to target the public sector or business market.

In about 20% of the start-ups, the founder or a member of the founding team had a vocational education qualification – a proportion that has remained consistent since 1990. However, in most cases the individual either had a university degree, as well as a VET qualification, or had considerable professional experience after graduation.

Fewer than 10% of the 97 start-ups were direct spin-offs from research organisations. A much higher proportion was formed by graduates of local universities or by staff of universities or research organisations, acting in their individual capacity. This characteristic is similar to other research-intensive regions.¹⁴

In a region such as the ACT, the public sector market, including the military, is often a key market for entry and for growth. It is also an important source of talented individuals, those who have gained professional experience, knowledge and experience of technologies and who also come to see opportunities through working in the public sector. Overall, about 25% of the start-ups have targeted the public sector, a proportion that has markedly declined over time.

It is clearly the case that many start-ups (about 60%, but possibly more) are largely based on the application of information and communication technologies, for example, through the development of software, a website or an app, the development of an information technology (IT) device, or the provision of IT-related services. It appears that this proportion has increased over time.

ACT new venture/entrepreneurship ecosystem

The ACT is the most research-intensive city in Australia. An entrepreneurial ecosystem has evolved, particularly over the past 10 years, and includes a range of increasingly connected organisations and programs that promote and support entrepreneurship and innovation. The major components of this ecosystem are summarised in table 9, and discussed further below.

- *Policy*: with a view to broadening the industrial diversity in the ACT and leveraging the substantial resources of talent and technology in research and other organisations, the ACT Government has introduced a range of funding schemes and has established initiatives such as the Canberra Innovation Network and related entrepreneurship

¹⁴ Kirk & Cotton (2016); Barclays Bank (2014).

infrastructure. Through these and other funding mechanisms, the ACT Government has supported a number of significant small business initiatives, including the CBR Innovation Network, the Entry29 co-working space, the GRIFFIN Accelerator, and the KILN Incubator.

- *Finance*: as shown in table 10, a range of new venture financing opportunities are now available, from very early stage proof of concept to larger growth financing.
- *Markets*: public sector procurement has been a significant driver for the formation of many ACT start-ups and for their subsequent growth. Inevitably, in a small region with a dynamic labour market and strong networks among specialists, proximity and direct links play an important role in identifying opportunities and establishing initial market entry.
- *Human capital*: the population of the ACT is relatively highly educated. With the large and constantly changing population of students and researchers and the high level of mobility in the public sector, academic and consulting workforce, a diverse range of well-educated individuals spend some time in the ACT.
- *Support*: a substantial research base and the universities in the ACT contribute to the potential supply side for new venture in terms of talent and new technologies. Equally important is the increasing depth of support available from mentors, advisors and business angels (experienced entrepreneurs who invest their capital and knowledge in the very early stage of new high-risk ventures) through incubators and networks. The CBR Innovation Network (CBRIN), which is supported by and links all of the major research and academic organisations in the ACT, is supported by the ACT Government. This network delivers a range of support services to entrepreneurs but also services to develop the innovation ecosystem in the ACT. There have also been events (run by HACT, a start-up supported by GRIFFIN Accelerator) to raise awareness and inspire primary and high school students about the potential of science and technology in general – and innovation and entrepreneurship in particular. CBRIN also aims to connect and support 'social impact' start-ups, with several initiatives in the Canberra Innovation Network.
- *Culture*: the evidence suggests that an entrepreneurial culture has not been a strong characteristic of the ACT, but is now developing rapidly. The example of successful local entrepreneurs, the promotion of entrepreneurship in local universities and the promotion of initiatives by the ACT Government have contributed to this development. Several firms that formed as entrepreneurial start-ups in the ACT are now substantial firms. These firms include Aspen Medical, CEA Technologies and several others that have grown to be large companies with global markets and operations. This history is significant. These firms are exemplars of what is possible. They are also sources of capital, mentoring and individuals experienced in entrepreneurial firms, and these contribute to the ongoing evolution of the entrepreneurship ecosystem.

Table 9 Major components of the ACT entrepreneurial ecosystem

Entrepreneurial ecosystem components	Type of organisation or program	Specific of organisation or program
Policy	ACT Government	An increasingly explicit and funded set of initiatives by the ACT Government.
Finance	Government support programs	<p>Commonwealth research funding through a range of national programs (for example, the Entrepreneur's Programme, Commonwealth of Australia 2017).</p> <p>The CBR Innovation Development Fund – Competitive Grants: this grant program conducted by the ACT (with annual funds of \$1.45m) Government is aimed at supporting initiatives that develop the ACT's innovation ecosystem and enhance collaboration. The fund aims to support new initiatives to cover identified gaps within the innovation ecosystem.</p> <p>Innovation Connect: this is also an ACT Government program that aims to more directly support Canberra-based businesses to develop innovative products and services. It has two categories:</p> <ul style="list-style-type: none"> ▪ Proof of Technology: \$5000–\$30 000 of matching funding for proving a concept ▪ Accelerating Innovation \$5000–\$10 000 of matching funding to further accelerate commercialisation.
Finance	Venture capital and start-up funding	<p>ANU Connect Ventures: ACV manages two funds: the Discovery Translation Fund (ANU Connect's Discovery Translation Fund page) and the Seed Investment Fund (ANU Connect's Seed Investment Fund page). Both of these support commercial opportunities are based on ANU (and other ACT-based research institutions and local R&D companies) research and both were supported by the ACT Government.</p> <p>Discovery Translation Fund: sponsors proof-of-concept research with the objective of assisting commercialisation. Grants are usually in the \$25 000–\$50 000 range.</p> <p>Seed Investment Fund: some of the funding in this case is from the MTAA Super (the superannuation fund of Motor Trades Association of Australia) and the fund invests in early-stage ventures arising from the ANU and other local research, up to \$500 000.</p> <p>Capital Angels: this is a network of private investors, operating since 2005, who invest in companies, particularly from the region, with promising opportunities for high growth (Capital Angels website).</p> <p>Australian Capital Ventures: this is a venture capital fund within the Hindmarsh group, which invests in local ventures.</p> <p>Significant Capital Ventures: a joint venture between the ANU and the Hindmarsh Group, with support by the University of Canberra, also receives some funding from the ACT government. This new fund, which is expected to be in the \$10m to \$30m range, aims to strengthen investment links between business and research, and invest in early-stage start-ups.</p>
Markets	Market demand	The Commonwealth Government (including the substantial defence and intelligence and security agencies) and the publicly funded research and teaching organisations in Canberra are large and demanding users of information and communication technologies, and training and consulting services. The ICT sector includes perhaps 1000 firms, ranging from multinationals down to micro businesses, and employing about 8000.
Human capital	Tertiary education organisations	<p>ANU</p> <p>University of Canberra</p> <p>CSIRO</p> <p>UNSW</p> <p>Australian Catholic University</p> <p>CIT</p> <p>Private sector VET providers</p>
	Research organisations	<p>ANU</p> <p>University of Canberra</p> <p>CSIRO</p> <p>UNSW</p> <p>Research within several government agencies, for example, Bureau of Mineral Resources.</p>

VET in the ACT¹⁵

The major VET provider is the Canberra Institute of Technology, which has six locations (campuses) in the ACT and provides a diverse range of certificate and diploma programs and short courses to about 20 000 students. There is also a large number of more specialised private VET providers.

The overall structure of VET in the ACT is broadly similar to other states and territories. Participation in VET in 2014 by the ACT population aged 15–64 years was 7.2%, less than the average for Australia (8.7%), and participation is more skewed to higher-level qualifications and diplomas, reflecting the very limited manufacturing sector and hence the lower role of apprentices. However, government expenditure on VET was similar to the national average. Unemployment among the 15 to 24-year-old age group is relatively low in the ACT. It is perhaps not surprising therefore that the outcomes of VET are above the national average, as indicated by the proportion of government-funded VET graduates who were employed and/or continued on to further study in 2014 after completing their course in 2013. Student satisfaction with their VET course (proportion of government-funded VET graduates who were satisfied with the quality of their completed VET course in 2014) was marginally lower in the ACT (84.8%) than the national average (87.6%).

Recently, representatives of CIT have begun to participate in CBRIN networking activities.

Case studies of entrepreneurs with VET backgrounds

In about one in five of the ACT start-ups, the founder or a member of the founding team had a VET qualification. The following vignettes are drawn from interviews¹⁶ with four of these firms and address the relevance of their VET background for entrepreneurship.

Venture based on an app

One of the partners in this firm had a certificate III VET qualification. She commented that the content was not relevant to starting a company. Reflecting on her experience she considered:

It would be great if they offered more information around how to manage the process of forming a company, whether it be specific to the industry or just some general information around how you go about forming a company.

Like many new entrepreneurs, she found a lot of useful information on the web:

We did a lot of research and were able to find most of the answers online. We managed to create the company and its foundations with little advice or support in the beginning. Once we became aware of the Canberra Innovation Network we were able to seek advice from fellow entrepreneurs/like-minded people and industry professionals.

15 This section draws on Productivity Commission (2015) and ACT Government (2013).

16 These interviews investigated the background and experience of the entrepreneur and the knowledge and support they drew on in forming a company.

Social enterprise

The venture was started by three people: one had diploma-level qualifications from CIT and more recently a graduate diploma from a university, another had a degree and a graduate diploma from a local university and the third had no tertiary qualifications. The founder with qualifications from CIT did not find this background useful for the process of starting a company, although it was very useful for the technological aspects of the venture:

There is an enormous amount of entrepreneurial skills required to undertake the formation and successful funding of a start-up. None of these are covered in any known vocational courses that we know of.

The founders received a start-up grant from the ACT Government and support from an ACT accelerator:

Canberra's GRIFFIN Accelerator was significantly useful and helpful to [the firm] during the early start-up phase. Co-working space Entry29 hosted the GRIFFIN participants during the six-month GRIFFIN Accelerator phase, and the Canberra Innovation Network was also supportive. After successfully pitching for seed funding to the Angel Investors, [the firm] was accepted into the not-for-profit women's founder support network – Heads Over Heels. This provided a great deal of support and introductions to significant business leads.

The founder suggested the following as the areas of knowledge required for starting a new venture:

- knowledge of the law and legal processes associated with starting a company
- knowledge of the law around shares and market valuation of a company
- financial skills, including tax and incentive, shares
- knowledge of investment networks such as the angels network
- knowledge of the business accelerators able to coach start-ups
- finding mentors who have already successfully established start-ups
- business planning and marketing
- marketing for start-ups
- media skills
- pitching to angels, and potential mentors and investors
- investment – valuations, shares and negotiation with investors
- shareholder engagement.

Venture in the design and construction of recreation facilities

The entrepreneur, with a VET background, who began this venture reflects on what he learnt from VET and other experiences:

The VET courses I took were not really useful for starting the company; however, I'm better placed because of those courses as the company is more competitive within the tender process by my being able to demonstrate a more complex and varied skill set. I had owned and operated businesses in the past so that set me up to be able to get [this firm] started. I did undertake a mentoring program with an international business company and that was very useful.

There is a case for more targeted training in starting and running a business. From my observation of the way these training courses are designed and delivered, there is little scope for proper and meaningful training in running a business, let alone other vocations. I believe the training industry is flawed in many ways and is designed to get through-put and to get people 'trained', but does not deliver good outcomes.

An engineering consultancy

The entrepreneur who began this venture comments on the skills he would like to see in current VET graduates:

Both my business partner and [I] studied mechanical engineering at a certificate level and completed those in the early 80s ... the course was practical and covered a wide range of engineering knowledge. There was no business or business acumen content to my course. That experience I have gained on my own.

There should be more content covering the process of forming a company, at least as an elective. Not everyone wants to go into business for themselves but many do. The type of work you do changes when you have your own company and you need to have a different focus.

These days there are so many considerations to make; you need all of your employees being involved in how the business is run. We specifically look for graduates with a wider view of the world. We want employees who can approach their work in an active way, taking responsibility, suggesting possible improvements in operations, committing themselves to self-development etc.

It is important to note that, as with many knowledge areas today, a great deal of useful information is available through the web and many of these entrepreneurs used such resources. Several of the founders with VET backgrounds also drew on the advice and support of entrepreneurship support organisations in the ACT, including the GRIFFIN Incubator and the related co-working space. Nevertheless, most of those founders with VET backgrounds who were interviewed considered that entrepreneurship skill and knowledge should be introduced into VET courses.

A good practice example of a VET organisation supporting entrepreneurship: the Academy of Interactive Entertainment

The Academy of Interactive Entertainment (AIE) offers a one-year Graduate Diploma of Management for students who have completed the two-year digital games developer certificate, although only about 20% of certificate course students have gone on to undertake the diploma course.

The diploma course is described on the AIE website¹⁷ as:

The Graduate Diploma in Management (Learning) is a one-year course which is a great kick-start for graduates who want to learn how to create their own start-up digital media business. The course is designed to introduce students to the associated entrepreneurial skills required and the opportunities in the rapidly expanding independent games, animation and digital content industry.

The areas of study within the diploma program, which are designed to provide a framework for individuals and teams who are forming new games ventures, are listed below by competency code and title:

- BSBINN801A – Lead innovative thinking and practice
- BSBRES801A – Initiate and lead applied research
- BSBINN501A – Establish systems that support innovation
- ICAICT703A – Endorse business plan components for a new initiative
- BSBREL701A – Develop and cultivate collaborative partnerships and relationships
- BSBITB701A – Implement advanced electronic technologies
- BSBINN601B – Manage organisational change
- ICAICT707A – Direct research and business response to new ICT technology

Students undertaking the program are able to receive VET FEE-HELP.

The driver for this initiative, the founder and head of the academy, was himself an entrepreneur who started a digital games venture and was inspired by the start-up ecosystem around Stanford University. The AIE aims to create a 'hive' at their campus in Watson, a suburb of Canberra, where knowledge-sharing among the teams is encouraged.

The AIE is a not-for-profit organisation and surplus funds are invested back into the organisation. The company may also invest in some of the games companies formed through the Graduate Diploma of Management and also provides ongoing mentoring for these start-ups. A pool of \$150 000 has been established, and start-up teams from the three AIE campuses (Canberra, Sydney and Melbourne) can compete for funds from this source. The AIE also encourages teams to seek funding from other sources, including Innovation ACT. One of the start-ups from the AIE won an ACT pitching competition and has also won grants from other sources.

17 <http://www.aie.edu.au/courses/game_programming/advanced_diploma_game_programming>.

With approval from the VET regulator, the AIE added qualifications and appropriate units of competency to their scope. The competency units that form the new qualification were selected by the AIE and adapted to the goals and focus of the course.

AIE-linked start-ups

Ten games start-ups have been formed through the academy over the past five years, with a steady increase in the number each year. These start-ups are listed in table 10.

Table 10 Start-ups linked to the Academy of Interactive Entertainment

Year	Team	Game	Awards	AIE grant recipient
2012	Evil Aliens	Orbitor	<ul style="list-style-type: none"> ▪ Ifest winner 2011 ▪ The PAXpocalypse List: The Best of PAX Prime 2013 	2015: AIE-funded
2013	Wildgrass Games	Bearzerkers	<ul style="list-style-type: none"> ▪ Ifest winner 2011 ▪ The PAXpocalypse List: The Best of PAX Prime 2013 ▪ Kickstarted 	2014: AIE-funded
	Cardboard keep	Warden: Melody of the Undergrowth		2014: AIE-funded
2014	Siege Sloth	Evergreen	<ul style="list-style-type: none"> ▪ Ifest winner 2012 ▪ Ifest runner up 2013 ▪ 'STIR' funded ▪ Winner at innovation ACT business Pitch competition. ▪ Accepted into Indie Mega Booth ▪ Trade Connect grant ▪ Unite AUS 2015 – creativity award 	2015: AIE-funded
	Brain Box software Storm Worm	Dragon's Wake Storm Worm		2015: AIE-funded
2015	Pine Fire	Keiru		
	Hazard Fax	All the king's men Wrecky Road	<ul style="list-style-type: none"> ▪ Finalist at innovation ACT business Pitch comp. 	
	Great Helm	Robot wars		
	Bit Bunny	Stella Shift		

Source: Academy of Interactive Entertainment.

The following gives some detail on two of the start-ups.

- *Pine Fire Studios*: the three founders of Pine Fire Studios are graduates of both the Academy of Interactive Entertainment's two-year Digital Games Certificate and the AIE's Graduate Diploma of Management.

For the three founders, the academy's Graduate Diploma of Management provided a structured framework that guided the approach to forming the company. The AIE continues to provide facilities (a co-working space called Games+) for this and several other games start-ups, and the staff of the academy continue to provide advice to the founding team. In forming the company, they also obtained advice from the GRIFFIN Accelerator in Canberra, a facility supported by the ACT Government that provides mentoring to entrepreneurs starting ventures in the ACT.

- *Wildgrass*: a team of four graduates of the academy formed the company Wildgrass in 2013 while in the AIE Incubator program. The team worked together for over 12 months

to develop the game from an idea developed for a competition. The role of the AIE has been crucial:

It's where we all met each other, where we all learned our skills – and they are still somewhat supporting us with office space and some funding. Through the Academy of Interactive Entertainment's Incubator program we have been provided with the office space, business training and scholarships that we need to come in to work every day and make something happen. We realise that a lot of teams for other Indie developers across the world are actually quite dispersed, at times internationally. The AIE's Incubator is a fantastic opportunity for us to stay connected and not worry about many things externalised from development itself such as paying for office space.



Conclusions and implications

A review of the growing international literature on entrepreneurship and the role of VET systems in developing entrepreneurial awareness, skill and knowledge comprised the first stage of this study. The broad conclusions from this review can be summarised in the following:

- Economic (and related social) change significantly raises demand for new types and higher levels of skill and knowledge, with implications for all education and training organisations.
- It is generally recognised that, as a result of the changes in the workplace and in career paths, strengthening the enterprise skills of all students is critically important.
- As entrepreneurship careers become an increasingly viable option, the development of entrepreneurship skills is also becoming an important objective for education and training organisations, although identification of the appropriate skills for development and how they are best developed remain unclear.
- In a context of debate and experiment, VET organisations in many OECD countries have been introducing initiatives to strengthen enterprise and entrepreneurship skill development.
- The economic (and social) development of a city or region will increasingly be linked to the strength of its 'entrepreneurial ecosystem', of which VET organisations are part. These ecosystems evolve and function through the development and interaction of specific regional policy, finance, markets, human capital, support and cultural dimensions.
- Throughout the OECD, the regional dimension of economic, innovation, entrepreneurship and education policy and programs has become more important. Regional development strategies and entrepreneurial ecosystems can provide foundations for the strategies and relationships through which VET systems can strengthen their role in education and training.

The second stage of this study focused on the Australian Capital Territory. The ACT is not typical of cities and regions in Australia, in that it is a small research-intensive city dominated by the public sector. However, it displays an increasing level of entrepreneurship and has a rich entrepreneurial ecosystem, which includes several entrepreneurship support organisations. A survey of ACT organisations that had 'started up' over the past 25 or more years found that in about one in five of the start-ups the founder or a member of the founding team had a VET qualification. Except for some recent start-ups in digital games supported by an impressive program at the Academy of Interactive Entertainment, none of these founders considered that they had gained entrepreneurship skill and knowledge through their VET courses. The initiatives of the AIE provide a compelling exemplar for other VET organisations.

Implications of the review and case study for the Australian context

The emergence of a more entrepreneurial economy has unavoidable implications for the VET system in Australia, particularly given that Australia currently has no coherent national policy on entrepreneurship or education for entrepreneurship. The key issues arising from the review and the case study have the potential to be incorporated into a national strategy on entrepreneurship for Australia, one that takes account of the educational requirements for entrepreneurship and necessarily involves the tertiary education sector, which includes the VET system. The following points represent the main implications of this review and are identified as relevant to the formulation of a national strategy.

Strategy development

- The significant growth of entrepreneurship internationally and in Australia suggests a need in Australia for the development of a comprehensive entrepreneurship strategy, one which encompasses education for entrepreneurship.
- The strategy should be developed with reference to international and local experience and be guided by broadly based advisory bodies. Noting the evolutionary nature of successful entrepreneurial activities, an approach that strategically supports bottom-up initiatives and experiments is likely to be most effective, although broad directional policies will be required to clarify the scope and objectives of initiatives and set clear goals with measurable performance indicators. National programs should also encompass support for local area initiatives (program experiments, business plan competitions and co-working spaces).

Entrepreneurship learning

- The strong evidence that enterprise and entrepreneurial skills are becoming more important in the knowledge-intensive economy and for career success in the twenty-first century offers a compelling case for ensuring that enterprise skills are a key component of most VET courses and for including entrepreneurship skills and knowledge in at least some vocational education programs, perhaps particularly those in IT.
- The approach to developing entrepreneurial skills must emphasise practice-based learning; it will also be essential to involve experienced entrepreneurs in entrepreneurship-development activities and it will be important for VET institutions to build links with the existing entrepreneurship support organisations in their region and to ensure that VET students are aware of these support resources.

Entrepreneurship teaching

- Developing the entrepreneurial knowledge and skill of VET educators will require sustained investment and will involve their ongoing exposure to current entrepreneurial activity to ensure they remain up to date in the field; it will be crucial for these educators to interact with other regional and national entrepreneurship development programs.
- VET providers will need to build links with the existing entrepreneurship support organisations in their region, including incubators, business service providers, networks

and mentoring bodies, and to ensure that VET students are aware of these support resources.

- Developing cooperative links with business organisations and associations in their region will be important to VET providers, as these relationships facilitate the use of real-world experiences for developing staff and students. Also important will be recognition of the fact that, for many smaller firms, the transaction costs of interaction are likely to be a major impediment to collaboration in any form. It may be feasible for VET organisations, with support from local government (and perhaps business associations), to develop or strengthen the services to small firms, enabling them to link to VET providers.

Regional partnerships

- The importance of the regional dimension of entrepreneurship suggests that regional strategy development processes and regional entrepreneurship ecosystems will be critical, including for shaping the development of strategy at the level of regional VET organisations and systems.



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Appendix A

Table A1 ACT start-ups: summary table

Start-up name	Start Date	Major Market	Sector	Background of Founders						Research spinout	Team
				University	University +	VET	VET +	VET & University	Military, non-higher ed.		
XP SOFTWARE	1974	Envt	Software		X						
CEA TECHNOLOGIES	1983	Defence	Defence eqpt						X		X
ELECTRO OPTIC SYSTEMS PTY LTD (EOS)	1983	Govt	IT							X	X
TOWER	1985	Govt	Software		X						
SOFTLAW (NOW RULEBURST)	1987	Legal	Software		X						X
E-WAY	1988	Consumer	IT services	X							
BEARCAGE	1989	Business	Media		X						X
BIOTRON	1990	Medical	Pharma						X		
CITADEL	1990	Govt	IT services		X						
CODARRA ADVANCED SYSTEMS	1990	Defence	IT services		X			X			X
INTELLEDOX	1992	Govt	Software		X						X
ITL	1994	Medical	Medical instruments		X						
EDIME	1994	Business	IT services		X						
CATALYST	1995	Govt	IT services		X			X			
AIE	1996	Education	Education	X							X
MEDIAWARE	1996	Media	IT services		X						X
BISON	1997	Consumer	Design		X						
KORD DEFENCE	1997	Defence	IT device						X		X
LOCATA CORPORATION	1997	Govt	IT devices						X		X
BARMCO MANA PARTNERSHIP	1998	Business	Consulting				X				
PHARMAXIS	1998	Medical	Pharma						X		
OPAL SOFTWARE	1999	Business	Software		X						X
ALLHOMES	2000	Consumer	Website				X				X
BIGWORLD	2000	Consumer	Digital Game	X							
FUNNELBACK	2000	Govt	Software						X		
GEODYNAMICS	2000	Energy	Alt Energy		X						
GP SPORTS	2000	Consumers	Sports tech		X						
SEEING MACHINES	2000	Diverse	IT Device						X		X
ISECURE	2000	Govt	IT services					X			
EVALUA	2001	Business	SW service platform	X							
NOETIC GROUP	2001	Business	Consulting		X						
UBERGLOBAL	2002	Consumer	IT services						X		
ASPEN MEDICAL	2003	Govt	Medical services		X						X
INSTITUTE OF TECHNOLOGY, AUSTRALIA IOTA	2003	Education	Education services		X						
M5 NETWORK SECURITY	2003	Govt	IT services					X			
PERPETUAL WATER	2003	Households	Environment Tech		X						
WINDLAB	2003	Energy	Business services						X		X
STRATSEC	2004	Govt	Consulting		X		X	X			X

Start-up name	Start Date	Major Market	Sector	Background of Founders						Research spinout	Team
				University	University +	VET	VET +	VET & University	Military, non-higher ed.		
CORDELTA	2004	Govt	ICT services		X						
DYESOL	2004	Energy	Alternative energy		X						X
MHITS	2004	Consumer	IT Services	X							
SIMMERION	2004	Business	IT services		X						
SLICED TECH	2004	Govt	IT services		X						X
MAKIN TRAX AUSTRALIA	2005	Govt	Construction services				X				X
DEEKS HEALTH FOODS	2005	Consumer	Specialised food products		X						X
RED ROBOT	2007	Business	Business services								X
DATAPOD	2007	Govt	IT services	X							
GREENMAG GROUP	2007	Business	Consulting		X						
FRAMESKIN	2008	Recreation	Equipment								
LIPOTEK PTY LTD	2008	Medical	Pharma						X		X
DIGITALCORE	2009	Energy	Consulting		X						X
MYINFOQ	2009	Consumer	App	X							X
NEXUS EWATER INC.	2009	Household	Devices		X						
ECOSPECTRAL PTY LTD	2010	Defence	IT		X						
SUSTINEO	2010	Govt	Business services		X						
ENVIROLOVE	2010	Business	Business services	X							X
ISIMULATE AUSTRALIA	2011	Medical	Medical IT		X						X
ONTHEGO	2011	Recreation	Clothing	X							
TAKEABREAK	2011	Consumer	Social media		X						
COGITO GROUP PTY LTD	2011	Govt	IT services		X						
STALKTHIS	2011	Consumer	Web-based service	X							X
IMAGINE TEAM PTY LTD	2011	Business	IT services	X							X
QUINTESSENCELABS	2012	Security	IT		X						
REPOSIT POWER	2012	Energy	IT services		X						X
BIG ICE CREAM	2012	Education	Apps					X			X
SIGNONSITE	2013	Business	App		X						X
INSTACLUSTR	2013	Business	Software	X	X						X
CASTERLY	2013	Consumer	Social media	X							
MINERAL CARBONATION INTERNATIONAL (MCI)	2013	Business	Consulting		X						X
HEALTH HORIZON	2013	Medical	Website		X						
DILKARA ESSENCE OF AUSTRALIA	2014	Consumer	Personal care				X				
ENABLED EMPLOYMENT	2014	Business	Business services				X				
VERITEC	2014	Govt	IT services		X						
HACT	2014	Consumers	Community services	X							X
LIQUID INSTRUMENTS	2014	Research	Scientific instruments		X				X		
SYMBERRA	2014	Business & Research	IT services	X							X
PINE FIRE STUDIOS	2014	Recreation	Digital games								X

Start-up name	Start Date	Major Market	Sector	Background of Founders						Research spinout	Team spinout
				University	University +	VET	VET +	VET & University	Military, non-higher ed.		
KARMA	2014	Consumer	Social media					X		X	
FROGSENSE	2014	Education	Software					X			
ARITHMETIKA PTY	2014	Education	Web-based service		X						
MYBUZZ APP	2015	Consumer	App		X		X			X	
PROJECT X	2015	Consumer	Personal care				X				
PINE FIRE STUDIOS	2015	Consumer	Digital game			X				X	
MADE FOR ME	2015	Business	Business services	X						X	
OZGUILD	2015	General	App	X						X	
QUIZLING	2015	Education	IT			X		X		X	
SKOPEIN AUSTRALIA	2015	Consumer	Device	X						X	
SNAPKNOCK	2015	Consumer	Social media	X						X	
SOLAR BARE	2015	Consumer	Clothing		X						
SOCIAL MEDIA PLANNER	2015	Consumer	Social Media		X						
ESAFE CONSULTING	2015	Consumer	Web-based service		X						
MADE FOR ME	2016	Business	Business services		X					X	
SPROUTBACK	2016	Media	Social Media		X						
LUNARCY	2016	Consumer	App	X						X	
CERTIFIED RENEWABLE	2016	Energy	Specialist services	X						X	
HOTEL SUITCASE	2016	Consumer	Social Media	X						X	
SECURECOTTAGE	2016	Consumer	IT services	X							

Note: All material in this table has been sourced from the public domain.



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