Future of manufacturing

Varley Group: Modernising apprenticeships – Australia

Company initiatives to align apprenticeships to advanced manufacturing

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Introduction

Scope of the research
This case study report is part of the study ‘Policy developments and practices of apprenticeships in selected EU Member States and world competing regions’ carried out in five EU (Denmark, Germany, France, Ireland and Italy) and two non-EU countries (Australia and USA). The study is conducted in the frame of the Pilot Project ‘The Future of Manufacturing’ (FOME), proposed by the European Parliament and delegated to Eurofound by the European Commission (DG Internal Market, Industry, Entrepreneurship and SMEs).

One of the objectives of this study is to provide an analytical overview of apprenticeship systems in the selected countries and to review changes to the current systems following labour market shifts, changes in employment, career and mobility patterns and technological and structural change. Particular emphasis is placed on the impact of new technologies and the need for a high skilled and adaptable workforce in manufacturing and advanced manufacturing. This research is carried out in response to the increasing interest in apprenticeships among policy makers to tackle skills mismatches but also to integrate young people into the labour market. The appeal of apprenticeships is also growing in a context where new technologies are transforming work organisation and production processes across all sectors, particularly manufacturing. The findings from this research will feed the policy discussions around the role of apprenticeships for the future of manufacturing and inform policy making in the context of current or planned reform of apprenticeship systems and the necessary links to be established between education/training and industrial policies.

For general information on advanced manufacturing and the apprenticeship system in Australia, the case study report builds on the information contained in the national report on apprenticeships in the advanced manufacturing industry in Australia that was elaborated during the first phase of the study (Eurofound, 2018).

The case at a glance
This case study, of a single engineering firm operating in regional Australia, highlights the main challenges and characteristics of the advanced manufacturing landscape in Australia. As a sector that serves only a small domestic market, is remote from other markets and the associated technological developments, in which most of the activity is concentrated in small and medium enterprises (SMEs), much of the innovation in the sector is focused on process innovation to enable firms to develop functional flexibility and develop multiple products to maintain competitiveness. Conversely, there is much less scope for the domestic industry (much less individual firms) to advance new models of apprenticeship based on new job roles built around specific technologies.

The Varley Group is a family owned manufacturing firm based in the Hunter Region, approximately 150 km northeast of Sydney. When the company was established 130 years ago, Varley was primarily a small plumbing and boiler making business servicing the industrial maintenance and ship repair markets in the local harbour (Varley Group 2017). At the time of this study, Varley operates as a multinational and in diverse product markets and markets itself as an advanced engineering and manufacturing firm.

One of the key features of the company that stands out as an advanced manufacturing firm is its ability to adapt their services to a range of different industries. Currently they are providing customised services to emergency service, health, education and rescue vehicles, defence ambulances and arms storage facilities, industrial and recreational electric vehicles, power plant
restorations and rail maintenance works. While the company did not stand out as an innovator of new, advanced technology products, it exhibits an organisational culture that supports agility and adaptiveness in their processes and product line, and active involvement in strategic regional partnerships that helped their sustainability in an environment where manufacturing has been in decline.

The Varley case study also features dense linkages with regional networks; its planned approach to growing their skills base locally; and its reliance on flexible workforce skills and work organisation to maintain its competitiveness and operate in multiple product markets. These three features stand out as their key to securing a position in the future of advanced manufacturing in the region and more widely.

Varley is located in a region that has recently undergone a transformation from mass production of steel to more specialised, advanced manufacturing led by small to medium enterprises like Varley. It provides an example of a firm that is supported by and active within a strong regional cluster and is in the midst of an industrial transformation.

**Assessment of the case study against selection criteria**

As regards the four different forms of adaptation of apprenticeship that are addressed by the research, the case addresses a) modernisation of a specific occupation, and d) organisation of apprenticeships in (regional) clusters. Varley has attempted to broaden out the traditional engineering apprenticeship, with the assistance of the main industry association and networks of other local firms and education providers, to achieve more functional flexibility in its workforce. It is also exploring whether a model of apprenticeship that links the standard VET qualification with a university degree can be integrated into their workforce. As an SME operating in a small domestic market (common to much of Australian manufacturing), it would be difficult for Varley to either create an apprenticeship for an altogether new occupation (adaptation form b) or create company-specific apprentice training (adaptation form c). The creation of company-specific apprentice training is also constrained by the Australian regulatory framework for apprenticeships (described elsewhere).

**Structure of the report**

The report is structured in three parts: a general part with background information, (including context factors; a descriptive part which outlines the set-up and implementation process; and an evaluative part which deals with outcomes and impact. In a final section, the initiative is viewed in a broader perspective and in relation to the continued development of apprenticeships in the advanced manufacturing sector, and relevant conclusions are drawn in the light of subsequent developments.

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1 These are: (a) modernisation of a specific occupation; (b) creation of new occupations/emerging occupations; (c) creation of a company apprenticeship / training programme; and (d) organisation of apprenticeships/training in (regional) clusters.
Context factors

Regional/sectoral and/or company-specific set-up

The Varley Group is based in Tomago, an industrial suburb northeast of Newcastle in the Hunter Region. The Hunter Region has a long history as an industrial (and agricultural) hub of the state of New South Wales (NSW). Coal mining, grazing and wine production commenced in the 19th century. Steelworks were established by the mining company BHP at the beginning of the 20th century, taking advantage of the ready availability of coal in the region. Later on, the region saw expansion of its industrial activities, including into electricity production and aluminium smelting. In the last decades of the 20th century, both state and federal governments invested in the region, particularly in stimulating employment in the services sector. In 1999, BHP closed its steelworks; however, the National Structural Assistance Fund (NSAF) provided for federal government assistance to ensure that the region did not lose its manufacturing and engineering industries. Assistance was provided to manufacturing firms located elsewhere to relocate to the Hunter Region. Currently, manufacturing makes up 9.9 per cent of the region’s workforce, making it the largest employment sector in the area (NSW Department of Planning and Environment 2016).

An active network supports industries in the Hunter Region. The network includes:

- Government departments and agencies
  - Federal government agencies/departments including the Department of Defence; Department of Regional Development; Commonwealth Scientific and Industrial Research Organisation (CSIRO) and AusIndustry, a division of the Department of Industry, Innovation and Science
  - State government agencies/departments including the Department of Industry, Hunter Development Corporation, Jobs for NSW

- Education and training providers
  - Technical and Further Education (TAFE) NSW, including the location of NSW TAFE’s Innovative Manufacturing, Robotics and Science Skillspoint being located in this region
  - University of Newcastle, including their Hunter Research Centre, Newcastle Innovation HUB, Hunter Medical Research Institute (HMRI), Newcastle Institute for Energy and Resources (NIER)

- Other vocational education and training providers

- Industry groups
  - Newcastle Branch of the Australian Industry Group (AiGroup)
  - NSW Minerals Council
  - HunterNet (an engineering, manufacturing and specialised regional industry cluster)

- Trade Unions
  - Australian Manufacturing Workers Union (AMWU) Newcastle Branch

The recognition of the industrial significance of the region is signalled by the state government’s investment in developing a 20-year regional plan, the Hunter Regional Plan 2036. This plan identifies the development of advanced manufacturing, defence and an aerospace hub as one of the directions the region should pursue in realising the goal of Hunter becoming a leading regional economy in the country (NSW Department of Planning and Environment 2016).
The public investment in the economic growth of the region may indicate optimism, and there are some positive economic trends. For example, the overall unemployment rate declined from 5.7% to 5.1% between mid-2016 and mid-2017. Youth unemployment rate declined from 13.6% to 10.8% over the same period, although the youth unemployment rate remained high by national and historical standards (Hunter Research Foundation Centre 2017). The number of youth apprentices and trainees in the region has also fallen across the different industry sectors, with manufacturing seeing the greatest decline. Manufacturing was reported to experience the largest job losses in the five-year period between 2011 and 2016 with 8,900 jobs lost (Hunter Research Foundation Centre 2017).

**Relevance of dual apprenticeship**

There is continued support for dual apprenticeships among industries in the region, including at Varley and by TAFE NSW, the public vocational education and training provider. However, both regionally and at Varley, new configurations are being explored and beginning to be introduced. TAFE NSW, the largest public provider of vocational education and training in Australia has been substantially restructuring its organisational structures and business model since 2016. One outcome of this restructure is the establishment of industry hubs called SkillsPoints for each of the key industry areas and locating them strategically across the state. The Innovative Manufacturing, Robotics and Science SkillsPoint that was recently established in Newcastle is aimed to support partnerships between employers, industry partners and TAFE NSW to inform new training programs with emerging trends from industry, and to increase enrolment in courses in these areas.

TAFE NSW and the University of Newcastle have this year agreed to introduce a joint program to provide a better pathway for young students who are interested in the engineering trades. Students will be able to enrol concurrently in a Bachelor of Engineering (electrical and electronics) degree at the University of Newcastle and an electrical apprenticeship, with off the job training in the Certificate III in Electro-Technology provided by TAFE NSW. The integrated qualifications are intended to develop greater practical knowledge and skills that are beneficial for graduate engineers who are aiming to work in industrial engineering contexts (Ai Group 2017).

In addition to exploring new configurations of the apprenticeship program, the region is utilising available government funding to increase interest and enrolment of young people into apprenticeship programs. The STEM-Ship program is an initiative of Regional Development Australia Hunter (RDA - Hunter), an inter-governmental economic development agency, in collaboration with the NSW Department of Industry and TAFE NSW (RDA Hunter, 2017). The program, now in its second year, is a pre-apprenticeship program designed to raise awareness of STEM and enterprise skills among early school leavers. From this pre-apprenticeship course, students may gain apprenticeships, traineeships or employment at the company in which they completed a work placement. Another initiative is P-TECH, an Australian federal government initiative designed to ‘increase the number of students undertaking STEM studies in senior secondary school, and then in post-secondary education and training’ through collaboration between industry and schools to design learning activities and providing mentoring to students (Skilling Australia Foundation 2017). Students are given the option of studying and working towards VET certificates while studying in school (for example in Advanced Manufacturing, Aeronautical skills and Remote Pilot- or drone operator), and having an industry mentor.

Awareness in schools of manufacturing careers and apprenticeship pathways is essential to maintaining a pipeline of manufacturing apprentices. Despite government initiatives to promote STEM education in all sectors of education, including in VET through appropriate
communication and partnership strategies with stakeholders including VET providers and industries, there are concerns about the level of awareness and understanding that schools have about VET pathways, including pre-apprenticeships. Moreover, efforts to enable school students to study VET courses while they are still in school through ‘VET in schools’ program have been hampered, according to Polesel, Klatt, Blake and Starr (2017). They argue that too often, employers were seen solely as suppliers of work placements rather than a partner with a greater role in helping schools determine the most productive vocational programs they could establish for their students. The lack of clarity about the purpose of VET in schools and pre-apprenticeship programmes (for example, for employment efficiency or for labour market equity) and the need for sustained and genuine partnerships between education providers and employers have been found in other recent research as well (Clarke, 2013; Toner & Lloyd, 2012), as well as the need for the partners to be willing to cross their traditional boundaries (Flynn, Pillay & Watters, 2016).

A crucial issue for advanced manufacturing firms like Varley is how to continue to attract high achieving apprentice candidates with sufficient ability in mathematics when the proportion of secondary school graduates going on to university exceeds 50 per cent. In the broader research literature about the teaching of STEM related disciplines such as mathematics, there have been ongoing discussions about the disjuncture between academic mathematics and mathematics in workplace practice (Wake, 2014). In particular, there have been studies that highlight how with new digital technologies, the mathematics involved in traditional work tasks is increasingly ‘black-boxed’, that is invisible and requiring less direct human intervention (Strässer, 2007; Williams & Wake, 2007). Mathematics education researchers such as Jablonka (2010) have argued the differences between what mathematics teachers and what industry might expect as the aims of teaching mathematics, particularly mathematical modelling, as the difference between teaching to develop ‘constructors’ of models versus ‘consumers’ or ‘operators’ of models. Wake’s (2014) and William and Wake’s (2007) studies illustrate how critical it is for both students and teachers to see how mathematics is embedded in workplace practices if they are aiming for the school mathematics education to be relevant for the workplace.

**Needs and challenges related to manufacturing and advanced manufacturing**

According to the representative from the AiGroup (Hunter), the key need related to manufacturing and advanced manufacturing is to enable companies to be adaptive to changing markets, diverse customer needs, and new technologies. This implies training curricula not to be ‘strait jacketed’ by training that develops narrowly skilled workers, but to have the flexibility to allow more ‘hybrid’ workers who have skills across traditional occupational and technological boundaries. Both the AiGroup representative and the production manager at Varley commented that the current Australian Training Package regime, the national process by which the contents of qualifications is determined, is restricted in this regard. They said that it would be beneficial if Training Packages were flexible enough to be customised for different needs, for example to mix and match units from the electrical and mechanical trades training packages. The traditional trade licensing system added another layer of difficulty, according to the AiGroup representative. They argued the electrical trades union was an obstacle because of its rigid defence of the licensing system. AiGroup felt that the training system was operating in the context of an industrial world that is becoming redundant and apprentices are taught subject areas that are too delineated and

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old-fashioned. In the view of the AiGroup (Hunter) the licensing system was “a hugely conservative barrier to modernisation and the main culprit is the electrical trades union [who were] steeped in the past, and can’t come to terms with the modern world’.

The view of the AiGroup is that training in the different kinds of manufacturing are faced with different degrees of challenges in their positioning in an advanced manufacturing context. He assessed the TAFE training in the electronics area was up to date and exposed students to advanced technologies, and generally very progressive in its approach. In the areas of steel fabrication, and metal machining, he felt that training was more conservative, and there was a need to expose students to more computer aided applications and introduce them to design work, such as proto-typing using 3D printers.
General information on the case

Background and reasons for initiating the practice
As a company situated in the Hunter region, the Varley Group shares the concerns about the need to build and maintain a local skills base and to be part of the economic growth of the region. Coupled with this is the realisation that the company has to be adaptive and agile in its product and services, and therefore in its workforce development and organisational practices. The HR manager acknowledged that the recruitment practices that had been in place until a decade ago often relied on existing personal networks as the basis of selection, resulting in workers who had no real passion for the work or who had to be moved from one trade to another because they had not made an informed decision about their selection of the trade area. Changes to overcome these problems and emerging challenges required not only changes to the selection process, but a change in the organisational culture.

As part of a regional network initiative, in 2013, the AiGroup (Hunter) organised a ten-day German Study Tour to inform Varley and other Hunter companies about current organisational practices (Ai Group Newcastle, 2013). The tour group included a representative from the AiGroup (Hunter); and the following firms: Total Fabrication Services (78 employees), My Metals – Sydney (18 employees), Varley Group (500 employees); a doctoral student from the University of Newcastle; and a consultant. The study tour, involving visits to twelve companies, focussed on management philosophy; education; implementation of lean manufacturing methods; organisational development; safety; cooperation across a range of stakeholders; and innovation.

General and detailed objectives and expected results
The overall objectives of the Varley Group’s approach to apprenticeship rests on its interpretation of advanced manufacturing as agile and adaptive manufacturing, and the need to reflect the principles of adaptiveness and agility in their future workforce.

The company translates these objectives into their recruitment and support of apprentices. They are committed to and engaged in providing work placements to school students and working with schools to raise awareness of manufacturing apprenticeships. They expect to generate more informed and passionate applicants to apprenticeships at their company, thereby increasing their chances of employing apprentices who are more likely to complete the apprenticeships and be willing to continue to work for Varley’s. Each apprentice is now rotated through different work areas so that they have the chance to work with a wide range of tools and equipment and diversify their skills. Varley expects this strategy to result in a more multi-skilled workforce than they might have trained in the past, and increase their ability to respond quickly and effectively to new market demands.

Linkages to national programmes and initiatives
The main national initiative that Varley is linked in with is the P-TECH program to promote education– industry collaborations as a way of creating pathways to STEM-related further education and training pathways.

The AiGroup (Hunter) is closely observing the outcomes of the Apprenticeship 4.0 pilot of higher apprenticeships involving Siemens and Swinburne University in the state of Victoria. AiGroup (Hunter) is keen to explore the possibility of similar initiatives in the Hunter region should the evaluation of these pilot schemes look promising.
Scope of the programme/initiative
The Varley case study is primarily one of multiple strategies for growing its skills base through collaboration with its local partners and through organisational culture change to ensure that no skill or worthwhile idea in the organisation is lost due to structural barriers.
Project design, planning and implementation

Needs assessment and type of change implemented

According to the representative of the AiGroup (Hunter), the 2013 German Study Tour was instrumental in confirming the directions that businesses in the Hunter Region needed to take for the future of manufacturing in the region. Some of the most important findings from this study tour that were reflected in Varley’s HR Manager’s account of what Varley was pursuing are:

- Placing a strong focus on high value and quality of their workforce, and their products and services
- Valuing education and learning
- Taking the adoption of lean methods as a given
- Developing an organisational culture that respects all workers’ contributions
- Establishing high-level cooperation between the business units (‘the office’) and the staff (production floor)
- Working in cooperation with other businesses, education providers, government agencies and industry associations in the region

The changes that were motivated by the findings from the regional initiative such as the German Study Tour, and then implemented by Varley include:

- A less hierarchical organisational culture, allowing engineering design personnel, managers, trades and technical staff together to put forward and discuss ideas for improvement
- A more rigorous selection process for recruiting new apprentices, trainees and workers more generally to enable a selection of employees based on psychometric testing and indication of genuine passion and commitment to the kind of work they will be doing
- Initiatives to multi-skill apprentices so that they are able to perform hybrid tasks rather than be limited to a narrow set of tasks
- Taking up regional initiatives to partner with schools and other organisations in outreach programs to raise awareness of manufacturing trades and provide pre-apprenticeship programs that could lead to apprenticeships and other further education and training programs

Varley did not stand out as a firm producing products and services that required advanced technical skills and technologies in their processes. For example, at the time of the research there was no computer aided-design work or use of 3-dimensional printers on the shop floor. Varley staff acknowledged that apprentices had to learn the knowledge and skills about advanced computer aided design work and the use of 3-dimensional printers in their VET courses. The representative from AiGroup (Hunter) also acknowledged that it was not advanced technologies in which Varley’s reputation as an advanced manufacturing firm primarily rested; rather it was their organisational culture and processes that were enabling them to be responsive to changing needs and contexts. For example, in the initial design product and the work process design, the company involves all staff (shop floor staff and office staff) in mapping the workflow, including sequencing of tasks, timing, determining quantities of materials needed in order to minimise waste and maximise efficiency. The application of lean manufacturing principles together with permeability between ‘the office’ and ‘the shop floor’ was commented upon by Varley staff as a critical factor in their success as an organisation.
Involvement of different actors

In the Varley case, the involvement of the regional actors such as the AiGroup (Hunter), Hunter TAFE and RDA - Hunter is consistent and well established. As is typically the case in Australia (especially at regional level), collaboration among actors is entirely voluntary. Participants are motivated by shared interests and access to expertise. The AiGroup (Hunter) is a regional branch of the parent peak employer association AiGroup, and facilitates a number of information sharing and networking to support businesses in the region. Hunter TAFE is now the site of TAFE NSW’s Innovative Manufacturing, Robotics and Science Skillspoint, a recent initiative of TAFE NSW aimed at bringing together TAFE NSW, business and industry to design courses that meet the emerging skills demands of employers. Engagement of RDA-Hunter with businesses such as Varley, through the AiGroup (Hunter) and the TAFE NSW Skillspoint, ensures that initiatives and investment in the manufacturing sector are integrated with the social and economic plan for the Hunter Valley region.

The University of Newcastle, the local higher education institution, is another key actor in the region providing Research and Development (R&D) support, as well as producing graduate engineers for companies in the region. Varley’s strategy is to, where possible, offer internship opportunities (paid and unpaid) to university engineering students while they are completing their course. As a company with some in-house design and R&D capacity, Varley has an interest in recruiting university graduates as well as apprentices. As mentioned below, the University is now in a partnership with TAFE NSW to offer a dual qualification in engineering to expand options for potential students, and to produce a new kind of workforce of people who can work flexibly with and on the production floor and in the design office of the same company.

Financing

The dual apprenticeship system attracts some financial incentives for both the training provider and the employer. The employer receives A$4,000 (approximately €2,500) from the Commonwealth (national) government for each apprentice, paid in instalments on commencement (A$1,500 / €940) and completion (A$2,500 / €1,500) for qualifications that are on the national skills list. Training providers receive $13,300 (approximately €8,300) for providing off-the-job training in the Certificate III in Electro-Technology (for which the apprentice contributes $1,000 / €600 and the state government pays the rest). The apprentice contribution is sometimes covered by the employer in some firms, particularly large firms with a large number of apprentices. However, according to the Varley HR Manager, the employer payment simply creates an administrative burden for the company; she argued that Varley was not engaging apprentices for the monetary reward; their motivation was to train the kind of skilled workers that they need to grow their company. The HR manager said that Varley would prefer to be rewarded with a tax offset or alternatively preferential treatment in government tenders rather than payment per apprentice which only adds ‘bureaucratic paperwork’.

Apprentice wages at Varley follow the usual Australian pattern of being paid as a proportion of the qualified tradesperson rate. According to the 2017-2018 enterprise agreement3 (in the process of being certified), apprentices are paid a percentage of the hourly rate of the base trade qualification. The percentages range from 42% ($15.68) for a school leaver and 75% ($32.84) in the first year of apprenticeship to 88% ($32.84) for both groups in the fourth year of their apprenticeship.

Other forms of local, regional and/or national support and expertise

As a small to medium enterprise (SME), Varley relies on information and industry intelligence through their participation in regional networks. A recent report from the Advanced Manufacturing Growth Centre (2018) recommends firms identify complementary products and services, and keep abreast of new technologies and practices by collaborating with researchers and other firms.

Varley is a member of the Manufacturing Innovations cluster and the Lean Manufacturing cluster that are coordinated by the AiGroup (Hunter). The group involves other manufacturers and academic researchers based at the University of Newcastle and elsewhere. VET training providers are not currently part of the membership. The Manufacturing Innovations cluster was formed:

to bring about a group of likeminded (yet different) manufacturers, engineers, researchers and educators who, within the confines of protection of confidentiality, exchange stories and experiences about reinvention or new invention in their business as well as new products, materials and processes. Members can spark off each other and create more new ideas. (AiGroup Hunter 2017)

The Lean Manufacturing cluster is similarly a community of practice with the objective of sharing practice and knowledge. These clusters support the ability of SMEs like Varley to remain current in their knowledge about the larger business and industrial environment, and gain insights about areas of possible growth and hence recruitment and workforce development. Although these two clusters do not directly deal with apprenticeship recruitment or training, they expose Varley and its apprentices to new technology and business processes, which ensures that the on-the-job training that Varley apprentices receives is more and advanced and more current than the apprentices would otherwise typically experience. Off-the-job training providers such as TAFE NSW struggle to afford the regular capital investment to maintain up-to-date equipment and training instructors frequently lack currency in the latest technology.

In the area of recruitment of apprentices, initiatives in the school sector play a critical role in retaining young people in the region. As part of the region’s initiative to grow and retain their own skills base, Varley has been participating in pre-apprenticeship programs in local areas. Two schemes were highlighted by the HR Manager.

RDA (Hunter) has been supporting the STEM-Ship program, a 15-week integrated STEM (Science, Technology, Engineering and Mathematics) program at Hunter TAFE, with work placements at STEM-oriented firms, including Varley and other companies in the region. The program is aimed at both young people who had left school before completing twelve years of schooling, and those who had completed year 12. The program involves both training and work placement of 25 hours per week. The participants attend TAFE to learn about the design, creation and promotion of a product utilising advanced technologies, but also developing non-technical employability skills in the process. The program is designed to multiskilling the participants and thereby improve their attractiveness to the local firms. They work in firms such as Varley to gain experience of the workplace. After the first intake of eighteen students into the program in 2017, sixteen completed, and two gained employment in the firm in which they undertook their work placement.

Varley is also participating in P-TECH4, an Australian government initiative designed to promote STEM learning among secondary school students. Varley HR Manager explained that students

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would complete the pre-requisite qualifications for apprenticeships such as the Certificate 2 in Engineering in this program and would then be able to commence an apprenticeship upon completing their schooling. The P-TECH programme in schools is supported by a liaison officer who is funded by the Commonwealth government as part of the program. The officer works with schools and industries to improve school activities that are designed to create pathways into further education and training or employment.

Varley has a number of apprentices who developed an interest in manufacturing apprenticeships through participation in programs like P-TECH and STEM-ship. Apprentices who come through programs such as these are seen by Varley staff as being more informed and mature in their engagement in the apprenticeship program and more likely to complete their training.

Implementing the programme/initiative

Varley’s HR Manager argued the necessity of the company to break down the traditional demarcation between the managers and engineers in the ‘offices’ and the production staff. The Production Manager described the change as a ‘new culture of the workplace that valued the interplay between the engineers and the floor staff’.

Varley has introduced a more rigorous selection process for new recruits including apprentices. The HR Manager explained they now used psychometric testing to assess an applicant’s ‘safety and risk indicators’; cognitive capabilities (particularly mathematics, which is critical for those in electrical trades); literacy and numeracy (for example to read technical documents and report on safety issues); and ‘personality’ (for example, preference to work alone or as part of a team). She also explained it was important that the applicants had basic computer skills because accessing information and data, as well as managing their own employment routines (for example accessing pay slips and applying for leave) was a routine part of their work.

There was consensus among the company’s HR Manager, Production manager and the junior supervisor on the production floor that apprentices needed to be multi-skilled as far as possible. They would implement this by developing a plan for the four-year duration of the apprenticeship from when the apprentice is first engaged and aim to build in flexibility and multi-skilling in their skill sets by rotating them around different areas of the company’s operations during the apprenticeship. Typically, the apprentices would stay in one section for six to twelve months, and then be rotated to another section where they would be trained in a different job, involving new skills, machinery and equipment. The rotation program is aimed to give apprentices a broad and experience and skills development as possible. The rotation also enables apprentices to experience work at the different sites that Varley operates, in effect giving apprentices experience in a broader range of industry contexts; for example, rail, shipping and defence. Although the apprentice’s program is planned when the apprentice commences their program, the plan may be revised depending on the needs of the company at the time.

Apprentices are typically enrolled in a four year apprenticeship program which leads to a nationally recognised Certificate III qualification (equivalent to European Qualifications Framework Level 3 – secondary education and VET qualifications), attending classes at the VET provider one day a week and working on the remaining four days. Varley has fewer opportunities to influence the structure of the off-the-job training, as the competencies that make up the Certificate III qualification is determined at the national level by Industry Reference Committees.
Each accredited qualification consists of a set of units of competencies from a training package for the industry. For example, an apprentice completing the Certificate III in Engineering – Industrial electrician qualification would be required to complete 32 core units specified by the training package and one or more electives. Where apprentices have completed the same unit of competency in another qualification, the VET system would allow for recognition of prior learning for that unit.

Skills of those involved in training and mentoring personnel
Varley does not have formal training and mentoring personnel in their organisation. However, one of the junior supervisors on the shop floor who was judged by their supervisors to have the appropriate personality and disposition for mentoring was designated as the supervisor to mentor the junior apprentices. The HR Manager recognised that not all staff was suited to be mentors. However, the horizontal and open communication culture in the organisation made it easier for new apprentices to feel more included in the workplace.

Difficulties and challenges during implementation
The main difficulties and challenges identified by the Varley HR Manager and Production Manager relate to their desire to grow a more multi-skilled workforce. The HR manager said that from Varley’s perspective, qualifications were less important than the skillsets that the workers had. They felt that the current qualifications system in Australia was too rigid, and made it difficult for skills gained from prior learning in another trade to be recognised, and for workers to re-qualify in new areas of demand. Varley personnel did not believe that it was the training provider that was the barrier; rather it was the national training qualifications framework and the way in which industry training packages were designed and accredited.
Varley acknowledged that there were limitations in the range of exposure to advanced manufacturing processes in which they could train their apprentices. One particular area was computer-aided design (CAD); there was not a lot of work available for trade apprentices to experience CAD work as this was undertaken mostly by engineers and technicians in the ‘office’. Similarly, they felt that the TAFE courses lacked emphasis on some modern manufacturing approaches such as the use of 3-D printers for prototyping, lean manufacturing methods, and the kind of flexibility and resilience that workers in contemporary manufacturing workplaces needed.
The AiGroup (Hunter) representative also commented on the visible lack of 3-D printers in TAFE NSW that students needed to be able to work with. On the other hand, both Varley and TAFE NSW appeared to be working together in ensuring that the experience the company could not provide was being provided by TAFE NSW, and vice versa; the apprentice interviewed for this project confirmed this partnership in her comments.

See the qualification details at https://training.gov.au/Training/Details/MEM31215
Outcomes, impact and lessons learned

Major outcomes and impacts on company and region

At the time of the research, there were 10 apprentices in total, a decline from previous years where they had up to 25 at a time. In Australia, young people of working age who have completed their twelve years of schooling, or are in their last two years of schooling, are eligible to apply for an apprenticeship. In the last 5 years, they have commenced 2 or 3 per year with 4 or 5 in the finishing stages. Varley were keen to ensure that those who commenced were suitable and likely to complete the apprenticeship programme, and where possible, stay on as employees. According to the HR Manager, the new rigour they had introduced in the recruitment and selection process has led to better selection. The Production Manager added that they had been putting added effort in the interviewing process of applicants to ensure they recruited the people with the kind of commitment and passion they were seeking. According to the HR Manager, they had only sacked six of their apprentices over the last five years: two due to their work performance and commitment, and four because they did not have sufficient work to be able to keep them. They view the apprenticeship scheme and the strengthening of the selection process as an investment in their workforce, currently 700 in total within Australia, and 1000 including their overseas offices.

The more horizontal workplace culture of giving the shop floor workers engagement in production process decisions was reported to be working well. One example the HR Manager gave was a university engineering student undertaking an unpaid internship at Varley as part of his studies. He was placed on the shop floor to work with the tradespeople for six weeks before being placed in ‘the office’ with the engineers. This arrangement proved to be successful for all concerned as the intern gained insight into the realities of the shop floor that he otherwise would not have gained, and during that period solved a technical problem that the shop floor staff had been grappling with for some time. The result was a mutual respect between the intern engineer and the tradespeople. Another example was a situation where the tradespeople rejected the engineers’ schedule of work for a sandblasting job for a large delivery of new containers; the shop floor staff argued that the engineers’ proposal would cause unnecessary noise and waste and would result in lost work through downtime. The shop floor staff persuaded the engineers to adopt their counter-proposal which proved effective and efficient. Varley HR manager was enthusiastic about the new joint program between the University of Newcastle and TAFE NSW mentioned earlier, because it would produce the kind of graduates that would readily fit into the horizontal culture being promoted in the company. Thus in future, it is conceivable that apprentices would continue their study into a degree qualification. While there was no indication that Varley actively encouraged their apprentices to upgrade their VET qualification once they completed their apprenticeships, there would be higher level VET qualifications in manufacturing and related areas that apprentices could pursue. Moreover, many, if not all, Australian university engineering degrees have arrangements to give recognition to what apprentices have completed in their VET courses. While Varley staff did not express an intention to replace the traditional apprentices with those also studying for a degree, the new model is clearly attractive to a company such as Varley, which maintains an in-house design capability.

Attractiveness and capability of apprenticeship

Varley, according to the HR Manager and the Production Manager, are keen only to recruit those who are passionate and have a strong drive for the kind of work available in firms like Varley. The Production Manager said that he would want to see someone who was willing to learn, had an eye for detail, and was willing to work with the flexibility that was required in the workplace, for example, working in different sections as the demand shifted. He said that Varley’s has not
had to advertise to get apprentices in recent years; rather they had been able to make offers to those who came to undertake work experiences for school. However, the strong demand from potential apprentice candidates needs to be placed in context: in the five years between 2011 and 2016, employment in Australian manufacturing declined by a quarter (ABS 2016) as did the number of commencements in automotive and engineering apprenticeships (NCVER 2017: 4). Varley are recruiting fewer apprentices than in previous years, in line with reduced employment in the firm and the sector, but individual recruitment decisions for apprentices have become more important. The three year commitment to an apprentice is a long one given the rapid change in the sector. The company also has to overcome increased competition for potential apprentice candidates from higher education. The number of domestic undergraduate university places has increased by 23 per cent between 2011 and 2016 (Department of Education and Training 2018), drawing in many of the more academically able school students who would traditionally have been attracted to an apprenticeship. Firms like Varley need to do more to design and market apprenticeships so that they appear challenging, interesting and rewarding (including financially), while taking into account the lower academic achievement levels of the cohort.

The success of Varley’s involvement in out-reach and awareness raising programs in schools, and their more rigorous recruitment process is illustrated by the story of a first-year apprentice Robyn (pseudonym) at Varley who was interviewed for this project. Robyn exemplified the employee with passion and eagerness to learn. She was the only female apprentice in the workplace, but she said her gender was not an issue for her or the co-workers. She explained that as a school student she had always preferred the hands-on, practical workshop-based learning and had completed a multi-trade taster course before finishing her schooling. During this time the school had made her and her peers aware of post-school options, including apprenticeships, though she said the school talked more about university options.

Robyn had taken a year off from study to work part-time after finishing school. She then found the job at Varley and at the same time enrolled in TAFE as part of a four-year apprenticeship program. She said she was doing mainly sheet-metal work at Varley and the TAFE study complemented what she was doing at work ‘100 per cent’. She explained that the TAFE taught her theory and helped to put it in practice in the workshops so that at work, everything that she had to do had been covered in her TAFE course.

Robyn said she was committed to completing her four year apprenticeship, and if possible, would like to continue to work at Varley. She felt that completing the apprenticeship would be beneficial for her because it demonstrated her commitment, enabled her to have income, and gain valuable on-the-job training.

Key success factors and lessons learned
For Varley, the key success factor is the number of apprentices and skilled workers more generally that they can grow and retain. According to the HR manager, Varley believe that the effort they have put into the recruitment and selection process has been effective in attracting and retaining strongly committed staff who have ‘an eye for detail, are flexible, eager to learn … and have a personal drive’. They have also found that young people who have undertaken work experience at Varley have both sought work, and when successful in gaining work have proved to be valuable employees.
Commentary and conclusions

While the Varley case study does not involve the scale of radical innovation to apprenticeships evident at Siemens (the other Australian case study), it is a good example of the efforts that typical established manufacturing firms in Australia are attempting to maintain the viability of their enterprises and the traditional apprenticeship model in engineering and manufacturing. In the context of the transformation of Australian manufacturing and the associated decline in employment in the sector, for an established enterprise such as Varley to still be in operation and employing any apprentices at all is a significant achievement. Varley’s experience demonstrates that challenges of innovating apprenticeships within a complex regulatory framework and uncertain market environment, and the optimism that apprenticeship can be maintained and revived with a broader conception of skill and job roles, including a gradual extension into higher education.

Adjusting dual apprenticeship in the light of advanced manufacturing

The main adjustment to the current dual apprenticeship system that is being sought by Varley’s and the AiGroup (Hunter) is the ability to customise the training to firstly, lead to more hybrid qualifications that reflect the broader skill sets needed in the company, and secondly, allow workers to requalify in new areas without having to undertake a whole new trade course from the beginning. The development of new hybrid qualifications must occur at the national level through Industry Reference Committees, since apprenticeships require a nationally recognised qualification, and that is the only way to accredit a nationally recognised qualification. Existing arrangements for recognition of prior learning (RPL) provide more scope to encourage workers to requalify in new areas, though again this typically does not take place within a formal apprenticeship arrangement.

Varley’s and the AiGroup (Hunter) are enthusiastic about the new combined higher education and VET pathway, which combines an electrical engineering bachelor degree (AQF Level 7) with a Certificate III in Electrotechnology that qualifies the student for an electrician’s licence. An arrangement such as this is seen as attractive for several reasons. First of all, young people who are unsure about the difference between the kind of engineering work they want to do can experience both the practical and detailed work on the shop floor as a trade apprentice while also developing a broader disciplinary knowledge base needed by (university-educated) engineers. Secondly, the university course strengthens the worker’s conceptual skills – whether they are a technician or an engineer. Advanced manufacturing entails a more customised approach to design and production, so that conceptual skills are needed to imagine better solutions to the customer’s needs than what may have been the standard solution for a mass market. Equally important are the communication skills that are more strongly emphasised in the degree courses; workers need to be able to elicit critical information from their customers that would enable them to suggest the best solution for the customer, that could be better than the solution that the customer may have had in mind originally. Varley personnel believe that such a way of working is needed in an increasingly competitive environment.

In addition to adjusting the dual apprenticeship system itself, strategies are needed to create new pathways into apprenticeships. Varley has found that in their regional context, involvement in pre-apprenticeships and outreach programs is a worthwhile investment. It enables them to source skills locally and raise awareness in the community of what employment opportunities are available. Working with schools also enable companies such as Varley to have input into the ways schools teach students STEM – related subjects, and in ways that may be more compelling to young people as subjects that are relevant in the world of work.
Policy implications and transferability

The Varley case study highlights the imperative for regional policy support in growing and retaining a strong manufacturing skills base that would sustain a manufacturing industry. It is a region that has already seen some state government investment, for example in the location of the TAFE Innovative Manufacturing, Robotics and Science Skillspoint. The employer association AiGroup (Hunter) coordinates networking of companies in the region and had facilitated a study tour to Germany which appear to have informed a number of Varley’s key initiatives, for example, the shift in their organisational culture to encourage dialogue between the engineers and the floor staff.

The steps that have been taken in the Hunter region by Varley and its partners are identified by the Advanced Manufacturing Growth Centre (2018) as key to building resilience, defined as competitiveness through superiority in the quality of products and services, diversity of products and services, and flexibility in their processes. They identify a key role for the national government in assisting Australian manufacturers to achieve resilience in three ways:

1. Expand advisor expertise so that each company can receive better informed and targeted advice to improve their resilience;
2. Ensure funding is available for SMEs against targeted and strategic criteria, for example to expand markets or to improve the quality of products and services; and
3. Provide assistance for companies to increase connections with other firms, both SMEs and multinationals so that cross-sectoral and cross-border opportunities can be developed.

The Varley case also supports government initiatives to raise awareness about, and create pathways from school, to manufacturing apprenticeships. While STEM education receives attention in relation to school and university education, relatively little attention is given to the critical importance of STEM in vocational education and training (AiGroup, 2017). As identified in earlier research (Oliver & Karmel, 2011), pre-apprenticeship programs that give young people an authentic industry experience have positive retention and completion outcomes when the same people enrol in a vocational course.

The two key success factors for Varley: regional partnerships and networking, and creation of pathways for school students are areas that could be supported and strengthened by policy, not only in the region in which Varley is located, but in other regional areas in Australia.
References

All Eurofound publications are available at www.eurofound.europa.eu


Eurofound (2018), Australia: Policy developments on apprenticeship, Dublin.


Disclaimer: This working paper has not been subject to the full Eurofound evaluation, editorial and publication process.


Annex

A.1 Glossary of terms/abbreviations

<table>
<thead>
<tr>
<th>Type of organisation</th>
<th>Organisation</th>
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<tbody>
<tr>
<td>Ai Group</td>
<td>Australian Industry Group, the main employers association for the manufacturing industry</td>
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<tr>
<td>AMWU</td>
<td>Australian Manufacturing Workers Union</td>
</tr>
<tr>
<td>BHP</td>
<td>Broken Hill Proprietary Limited, a multinational mining company founded in Australia in the nineteenth century</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Science and Industry Research Organisation</td>
</tr>
<tr>
<td>RDA</td>
<td>Regional Development Australia</td>
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<tr>
<td>STEM</td>
<td>Science, Technology, Engineering and Mathematics</td>
</tr>
<tr>
<td>TAFE NSW</td>
<td>Technical and Further Education New South Wales, the main public provider of vocational education and training in New South Wales</td>
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A.2 List of interviewees

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<thead>
<tr>
<th>Type of organisation</th>
<th>Organisation</th>
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<tbody>
<tr>
<td>Company</td>
<td>Varley, HR Manager</td>
</tr>
<tr>
<td>Company</td>
<td>Varley, Production Manager</td>
</tr>
<tr>
<td>Company</td>
<td>Varley, Apprentice</td>
</tr>
<tr>
<td>Employer organisation</td>
<td>AiGroup, Project officer</td>
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The European Foundation for the Improvement of Living and Working Conditions (Eurofound) is a tripartite European Union Agency, whose role is to provide knowledge in the area of social, employment and work-related policies. Eurofound was established in 1975 by Council Regulation (EEC) No. 1365/75, to contribute to the planning and design of better living and working conditions in Europe.