Reimagining the workforce: building smart, sustainable and safe public transport. Workshop context paper.

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VICTORIA State Government | Department of Transport
RAIL MANUFACTURING CRC

Acknowledgements: The authors greatly appreciate the financial support from the Rail Manufacturing Cooperative Research Centre (funded jointly by participating rail organisations and the Australian Federal Government's Business Cooperative Research Centres Program) through Project R3.3.3 – Reimagining the workforce: building smart, sustainable and safe public transport (Victorian Department of Transport and Victoria University). The authors also acknowledge the assistance provided by the Victorian Department of Transport in this study and the following people for their contributions to the development of this project: Chris Eves, Stuart Thomson, Christopher Wong and Larry Jordon.

March 2020

Citation: Young, C., Jones, R. N., Ooi, D., Lung, S., Parry, N., and Heenetigala, K. (2020). *Reimagining the workforce: building smart, sustainable and safe public transport. Workshop context paper.* Rail Manufacturing Cooperative Research Centre, Melbourne.

This report is one of a seven reports relating to the 'Reimagining the workforce: building smart, sustainable, safe public transport' research project. The complete suite of reports is as follows:

1. The Victorian rolling stock context. Literature review.
2. Community perceptions of careers working with rolling stock.
3. Organisational context assessment of inclusion and innovation in the Victorian rolling stock sector.
4. Training for a future rolling stock workforce.
5. The economics of rolling stock manufacturing, maintenance and operations for Victoria's public transport sector.
6. Building smart, sustainable and safe public transport. Workshop context paper.
7. Reimagining the workforce for public transport: interim action plan.

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Introduction

The rolling stock component of Victoria's public transport sector workforce operates, designs, builds and maintains the trains, trams and buses used in Victoria's public transport system. Its workforce spans rail, buses and manufacturing sectors, and is central to the effective functioning and safety of public transport. Changing communities, organisational structures and the emergence of digital and cyber technologies (Industry 4.0) are driving the need for transformation across the sector. As these changes are likely to continue for the foreseeable future, building a suitably skilled workforce is now critical to the future sustainability of the industry.

Changes to contractual requirements, particularly local content and social procurement, also offer substantial opportunities for sector renewal at a local level. Building capability and resilience across the entire supply chain is now critical if the opportunities on offer are to be realised. Current workforce development challenges include:

- Rapid expansion in areas of the sector
- New technologies and service demands
- A lack of a positive workforce image
- An ageing workforce and skills shortages in key areas
- Changing training and upskilling needs
- Changing community expectations of work
- A need to attract and retain a diverse and skilled workforce for the future.

Since 2006, there have been numerous reports and recommendations in relation to workforce issues, but little cohesive response (Young, et al., 2020). All areas of our study indicate that solutions to the current issues faced by the sector are not contained within the sector alone, and that developing collaborative partnerships and understanding within and beyond the sector's agenda is now critical. There is also a considerable amount of information in relation to the nature of the problems, but little that supports the practical application of these recommendations (Young et al., 2020).

Achieving sustainable solutions to the above issues provides a considerable challenge to this sector, as many of these issues are entrenched and reinforced by cultural and structural aspects of rolling stock organisations and institutions. Addressing these will be a long-term prospect that will require the sector to look beyond its technological focus to the people and skills needed to enable and sustain changes. It will also mean reimagining industry jobs, who will perform them, and what is needed to perform them.

The purpose and aim of this workshop

The purpose of this workshop is to provide the opportunity for key stakeholders from across the industry to take an active part in addressing the above issues. Its aim is to identify three key actions and develop an industry-owned interim implementation plan. This interim plan is intended to provide an evidence-based foundation for future actions across the public transport sector that addresses the current workforce issues, builds sustainable growth of the future workforce and supports local economies.

Key questions for the workshop are:

- Where are the opportunities for actions?
- What is needed to realise these opportunities?
- Who should be responsible for implementing and enabling these opportunities?

A literature review and four research reports were undertaken prior to the workshop. These form the evidence base for the findings summarised in this context paper. Specific areas studied were:

- The organisational context examined existing strengths and assessed barriers, needs, opportunities and benefits with respect to an inclusive and innovative workforce
- How the 18–30 year-old community perceive and understand the public transport sector as a potential employer, and their general expectations for careers in the rolling stock sector
- The composition of the workforce, skill profiles and future needs, challenges and opportunities, and the economics of vocational training
- The economics of local procurement and its impact on future employment, especially in relation to small to medium enterprises (SMEs).

Project background

This workshop is the final phase of Reimagining the workforce: building smart, sustainable, safe public transport. This is a collaborative research project between the Department of Transport (DoT), the Rail Manufacturing Cooperative Research Centre (RMCRC), Victoria University (VU) and industry, which commenced on 1 July 2019 and will be completed by 30 June 2020. The aim of this project is to provide an evidence-based starting point for addressing the critical skills shortages currently facing the sector and what is needed to build a sustainable and resilient future workforce.

The project undertook a systemic assessment of the Victorian public transport rolling stock sector from three perspectives: economic, organisational and community in the broader context of the public transport system of trains, trams and buses. This was undertaken across the areas of procurement, organisations, training and the community. It used a case study approach that examined specific organisations within the rolling stock and public transport system in Victoria using an 'end user-based research methodology', which is transdisciplinary and combines end user and academic knowledge.

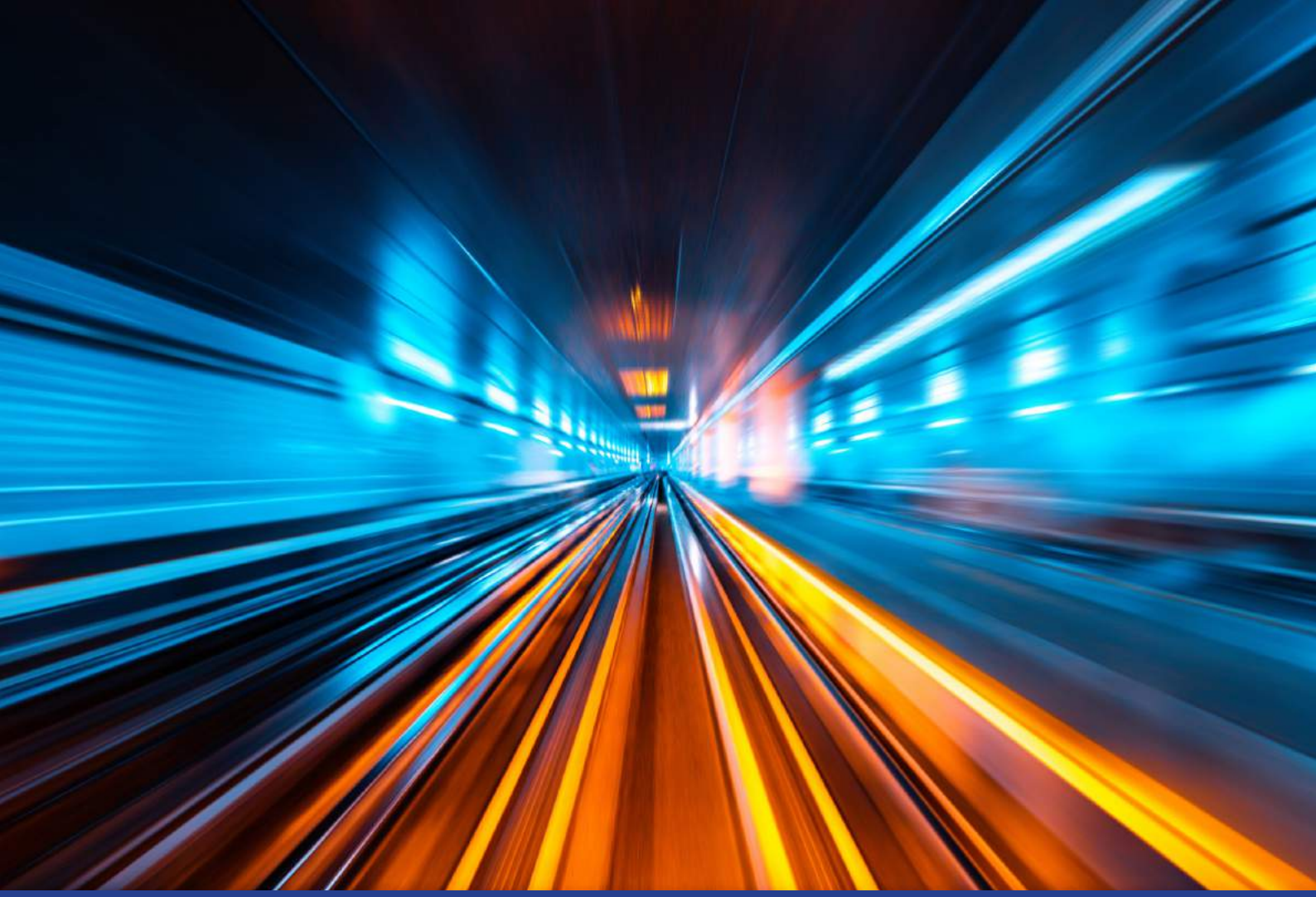
The current sector context

The current context that surrounds organisations is one of change that is highly dynamic, and a 'perfect storm' of aspects have shaped and influenced the sector. These have combined with the current social, environmental and economic drivers, resulting in pressures and new agendas arising that are resonating throughout the supply chain and driving change. This has intensified pressure in organisations as they work to meet increasing demand, and their internal need to transition and expand their workforce.

There is currently tension between what the sector has been and what it needs to become. This has highlighted factors that are hampering forward progression including:

- A number of different ideas of what the sector could become, but no tangible vision of what it wants to become
- The lack of clarity as to who is involved in the supply chain
- People skills are often seen of lesser value than technical skills
- Responses are primarily at an organisational level leading to an inconsistent and primarily reactive response at the sectoral level
- A lack of collaboration across the sector and external bodies.

There are also indications from the interviews that there is a lack of clarity as to how Industry 4.0 will manifest in this sector. There is a need to clarify what effect different emerging technologies will have in relation to the type of workforce and skills needed. In particular, what skills need to be retained, and what skills will need to be developed as technology evolves.



Understanding the potential future workforce – younger people and career choices

Understanding the potential future workforce – younger people and career choices

A key element of our research was to analyse the attitudes of young people aged 18–30 towards public transport careers. Based on a community survey of 1,011 young people from around Australia and 40 semi-structured interviews from urban and regional Victoria, we explored:

- What values and motivations influenced their career and job selection
- How they understood public transport and the careers available.

The topics of most importance come under the headings of:

- What attracts young people to careers
- Parental influences and sector perceptions
- Attraction to public transport careers
- Knowledge about rolling stock careers.

The current context

There is limited literature on broader community perceptions of careers in rolling stock. The majority of existing literature focuses on rail and engineering students. These are primarily based on industry employee's perceptions of what the community thought of industry, rather than views of the general community. The general perception is that the community has a poor perception of the sector.

There is a general acceptance of the need for greater public engagement and promotion in relation to public transport careers. However, there is not enough detailed research as to what forms of knowledge and engagement are likely to be most effective in this sector and what types of jobs different cohorts are most attracted and suited to. It is currently not clear whether more information, knowledge and patronage of transport services improves job attractiveness or the likelihood of younger people applying for jobs.

There has also been generational change in terms of how younger people think of jobs and careers, particularly the meaning they gain from work. The public good aspects of public transport, with respect to the environment and society, may increase its attractiveness and there is a large pool of international students in Australia gaining relevant skills (e.g., in engineering). Finally, barriers in the jobs market have contributed to individuals being less attracted to the sector. Some of these and their interrelationships are shown in Figure 1.

There are potential opportunities to improve community perception of public transport careers related to the growing awareness of climate change, and the need for innovative green public transport solutions as part of mitigating this. Also, the high proportion of international students in engineering courses in Australia are an under-utilised source of talent (Wallace et al., 2010, p17).

There are specific structural barriers faced by potential applicants for rolling stock jobs and complexities around the current job market, which are seen to have contributed to individuals not becoming attracted to the sector. Some of these factors are well-illustrated in Figure 1 (overleaf), reproduced from a TACSI (2017) report.

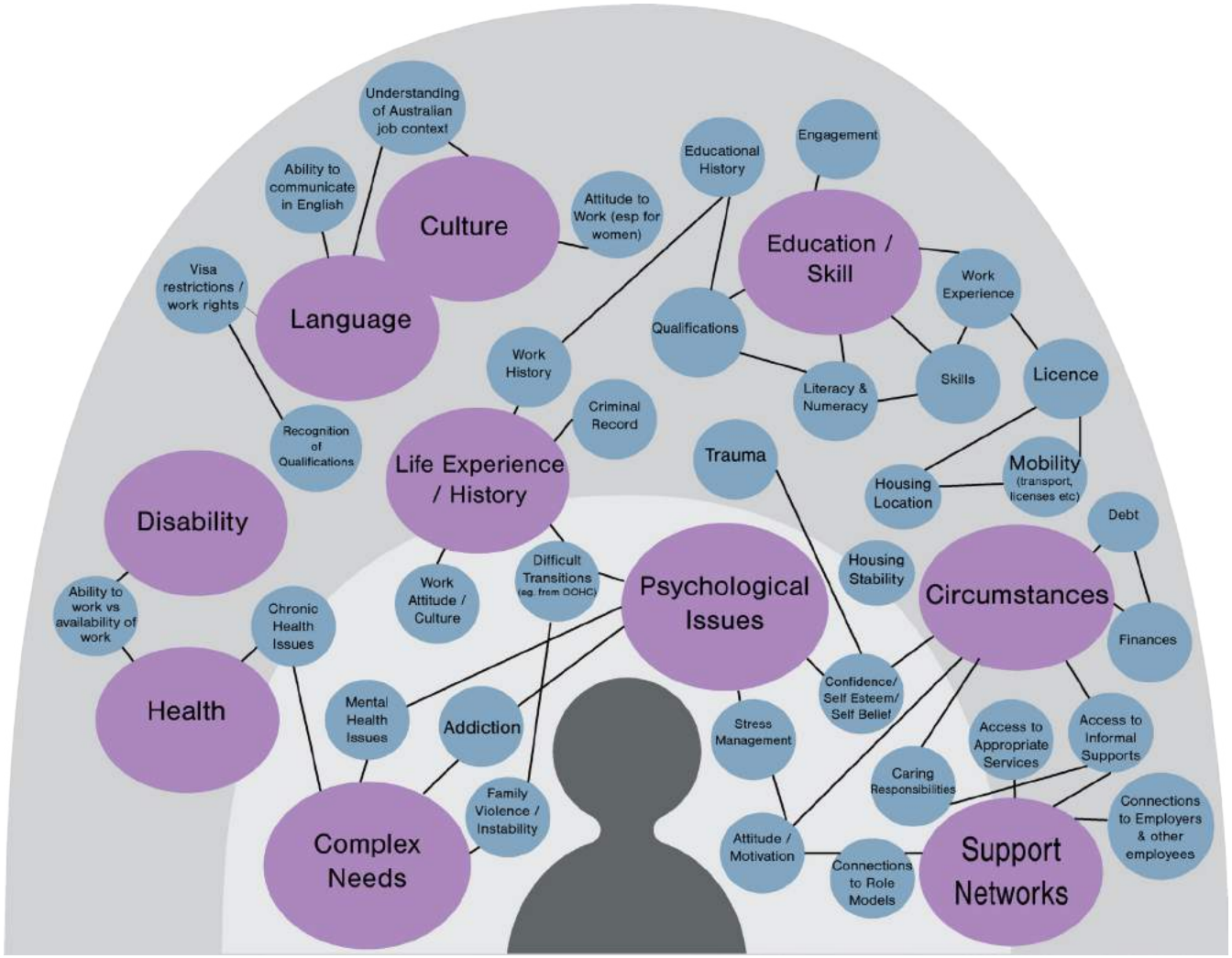


Figure 1: Structural factors shaping career selection (reproduced from TACSI, 2017, p19)

Career attraction

- Social purpose or a benefit to society was a key motivator when choosing a career, more so for females than males when presented as an option –with only 15% stating that lacking a clear benefit would not have them apply for a job
- Routine jobs gained higher interest than innovative jobs, but over half preferred a mix of both
- Career identity was shaped more by interests or tasks performed than a particular sector or employer
- Some had a strong entrepreneurial streak, and many science, technology, engineering and mathematics (STEM) graduates expressed a desire to start a business in the long term rather than be employed
- Interviewees showed a lack of knowledge as to what the rolling stock industry is and does, but it was not necessarily negative. 42% of those surveyed perceived public transport careers as 'highly innovative' or 'somewhat innovative'.

Parental influences are an important determinant of career choice

- Blue-collar and recent migrants were more likely to endorse their children's career choice as important
- Rolling stock-related professions were often not seen by parents as conferring social status
- Those studying engineering and trades nominated the water, mining and auto industries with little reference to trains, trams or buses.

Barriers to participation

Perceived gender barriers for female respondents included the sector being 'being male dominated', lacking safety and being sexist. Concerns about safety in the workplace related to safety with colleagues in the workplace – with customers/ commuters on the job, particularly when working alone (e.g., bus driver), and returning home from late-night shifts.

Interviewees from culturally and linguistically diverse (CALD) backgrounds regarded a diverse workplace as a less intimidating place to work. Twenty-two percent of the survey sample perceived there to be barriers to participation for those from CALD backgrounds, including language barriers, a predominantly white male workforce, discrimination, and a lack of cultural understanding.

Young people's attitudes to rolling stock careers

Survey responses to whether young people had considered a career in public transport were:

- 17% responded 'yes' to having considered a career with rail, and 31% responded 'possibly'
- 10% responded 'yes' to having considered a career with buses, and 23% responded 'possibly'
- 12% responded 'yes' to having considered a career with trams or light rail, and 25% responded 'possibly'.

Blue-collar participants were more likely to responded positively, and women and people of non-Anglo cultural backgrounds less likely. Figure 2 (overleaf) shows the responses of 1,011 respondents. Of these, 475 were male, 526 were female, and 10 did not identify as either gender.

Knowledge of careers specific to rolling stock was limited, being primarily focused on driver positions, with 'bus driver' and 'train driver' accounting for over 70% of first responses. There was little general awareness (beyond those studying trades and engineering), about the diversity of jobs in manufacturing and maintenance of trains, buses, and trams.

There was a high correlation between those who had considered a career in public transport and previous knowledge of career roles in public transport. When asked what information they would like about careers in public transport, females were more interested than males in further information.

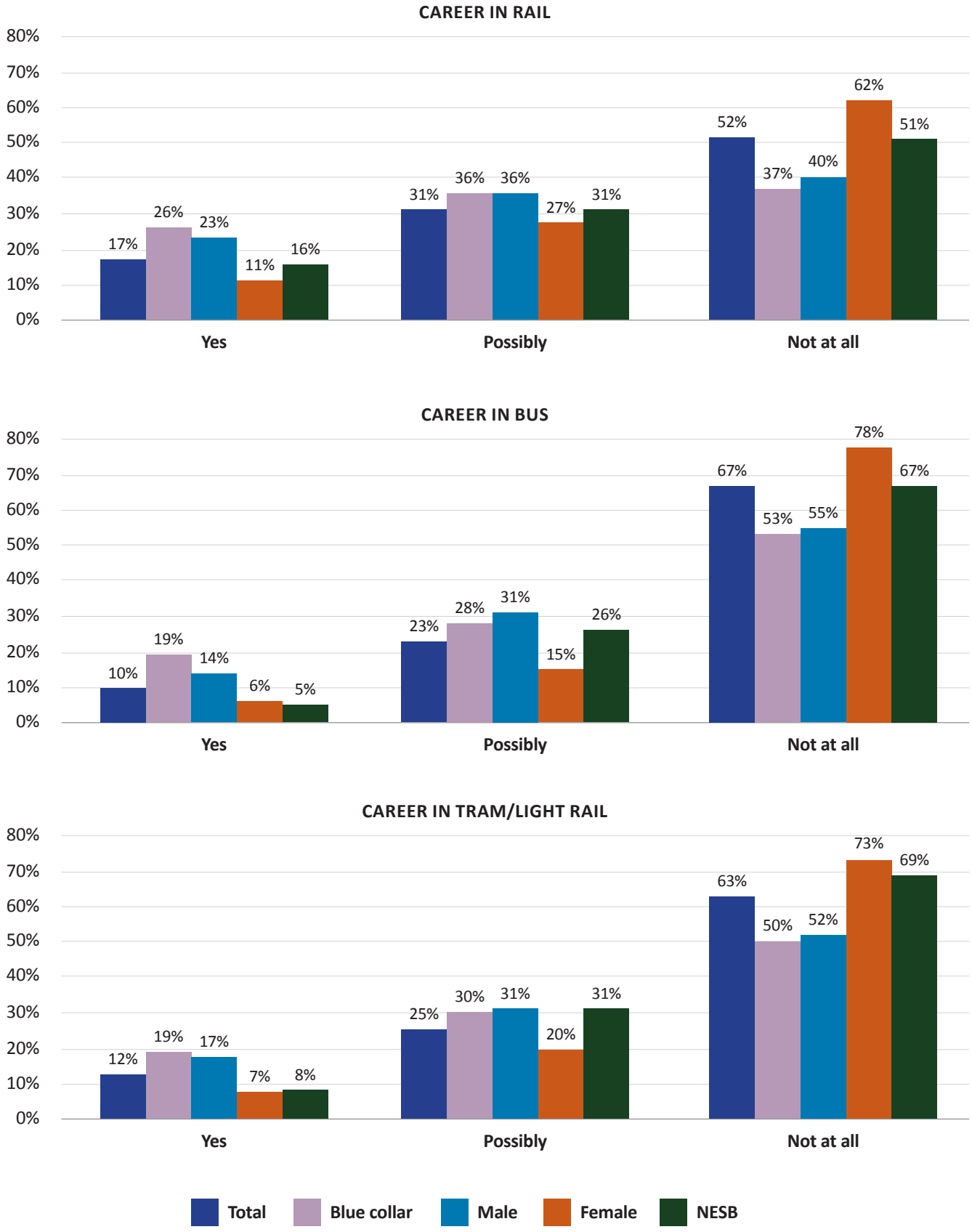


Figure 2: Percentage of respondents who had considered careers in rail, bus, tram and light rail

Data source: Responses to survey question 21: 'Have you ever thought about a career in the following public transport industries?' for (a) rail, (b) bus, and (c) tram/light rail. NESB n=153, blue collar n=356.

Needs and opportunities

Our research revealed that younger people were largely unaware of careers in public transport rather than being negatively disposed to the sector. It also revealed some of the motivations and attitudes to careers that the sector could take advantage of.

Needs identified include:

- Develop specific information and engagement activities to create greater awareness of the public transport sector and the types of careers available
- Identify more clearly and better leverage the segments of young people most likely to be interested in or attracted to careers in rolling stock
- Understand the values and motivations of younger people, where they are aligned with the public transport sector and leverage them more effectively
- Understand more fully the structural barriers that exist in the job market that can restrict participation of different cohorts of younger people.

Opportunities identified include:

- Develop a clearer image of the sector to leverage young people's interests and motivations, and positive perceptions of areas of public transport
- Develop a clearer understanding of the potential career paths this sector has to offer and their benefits
- Promote the social and environmental benefits of public transport, and the potential for social and green innovation to make the sector more attractive to young people
- Understand more fully what causes the 'disconnect' between interest in the sector and actual participation by developing specific strategies and initiatives to bridge this gap
- Understand more fully how to utilise international students in engineering courses in Australia as a potential talent pool.

Building inclusive and innovative organisations

Building inclusive and innovative organisations

The review of inclusive and innovation organisational cultures used a mixed methods approach that undertook a review of the literature (Young, et al., 2020), 63 semi-structured interviews, four organisational case studies, two focus groups, a visual audit of 50 websites, review of publicly available materials, and collection of data from a Rail Industry Safety and Standards Board (RISSB) Horizon event.

The current context

The current organisational context for innovative and inclusive organisations needs to be viewed in terms of the broader transformation that is currently happening across the sector, which is a complex long-term process (Figure 3). Technological changes and the need to diversify the workforce are likely to continue for the foreseeable future. The development of strategic approaches and tools is needed to support management of the social and technological risks systemically, to ensure effective outcomes. Organisations will also need to develop specific leadership and management capabilities to transition their people through these changes so they can become the future workforce that the sector needs.

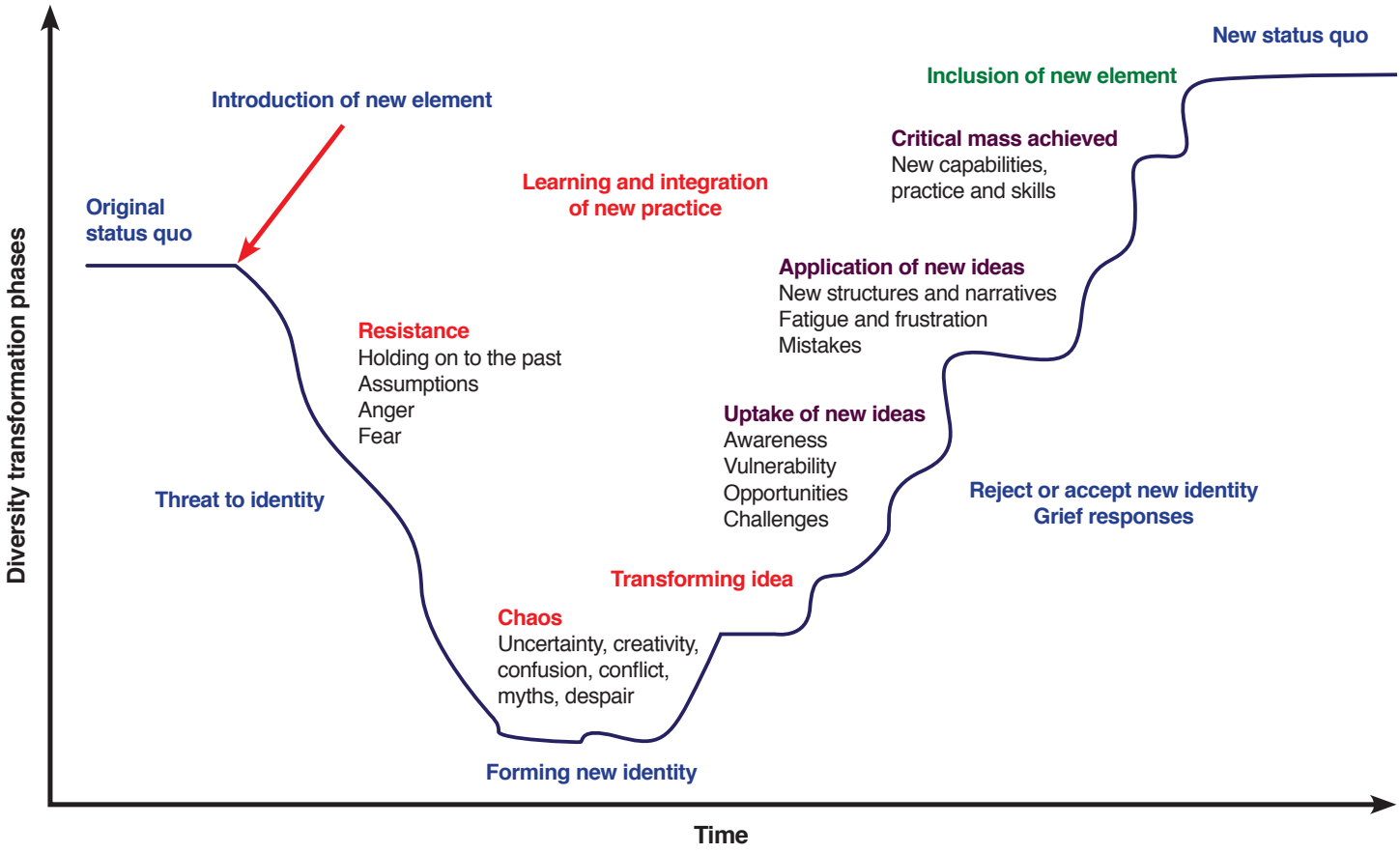


Figure 3: The transformation process (adapted from Young, et al., 2018).

Innovation and inclusion are interrelated and a key component of transformation. Successful adoption of innovation throughout the sector requires the inclusion of diverse thought and a skilled and diverse workforce that is able to adapt. It also requires social innovation and an understanding of how to manage the risks inherent in this type of innovation, to ensure the increasingly diverse workforce is functional and able to meet industry demands. These talents exist in different areas of the community, and being able to leverage this requires challenging established notions of what the sector is and who should participate.

Overview

Much of the rolling stock sector is actively involved in innovation and inclusion, however where they are positioned in the implementation process varies widely. Some organisations were well advanced, whereas others were at the early stages of the process. Key factors that dictated this were:

- Availability of resources and capital
- Leadership and management
- Current organisational focus
- Strategic and business capability and skills
- People capability and skills
- Organisational culture
- Openness to new technology and learning
- Access to knowledge
- Geographical context.

There is a distinct difference between large organisations and SMEs in relation to culture and capabilities. SME's capability was reported as generally lower than larger organisations, resulting in a lack of investment in innovation and workforce development. SMEs and those in regional areas also face different challenges compared to larger organisations or those in urban areas. This will require the development of specific programs and mechanisms to build capability to support effective participation in the supply chain. There is also a need to look at how pre-existing programs both here and overseas can be better leveraged or adapted to support this.

The development of people-based softer skills is critical to ensuring effective development of the workforce. One of the key challenges to this was that they were often seen to be of lesser value than more technically-based skills.

Inclusion

The organisational review found that a number of activities relating to increasing diversity and inclusion were being undertaken, with early adopters starting to report benefits and emerge as leaders.

- Understanding the imperative to diversify the workforce was generally good, but inclusive practice was still developing. There is a need to build specific skills to support this, particularly at management and leadership levels.
- Formal governance across the sector varied, with most large organisations having governance structures and SMEs having less formal reporting.
- More comprehensive measurement is needed to ascertain the effectiveness of diversity and inclusion programs. Measures of inclusion are emerging, and there is a lack of monitoring and evaluation of the workforce at the sector level. There were, however, measurements at a sector level in relation to women in the workforce.
- There are indications that cultural diversity is much higher in many organisations than publicly perceived or reported in the ARA 2014 Workforce Data Report.

Innovation

Innovation understanding was embedded in relation to product development, with the main type of innovation reported being adaptive innovation (modifying and repurposing). There was also some understanding of organisational innovation. Some Australian-based R&D collaborations were identified, but these were the exception rather than the rule, and primarily in large organisations. There is an opportunity to better leverage Australian university collaborations to develop local R&D, particularly in the SME cohort, to support healthy economic growth across the sector.

- Innovation was being monitored and evaluated in many larger organisations as formal reporting or informal updates, but this was largely informal and limited in SMEs.
- Socialisation of digital technologies within the workplace (particularly in trades-based areas), improved governance and collaboration were all nominated as existing areas for improvement.
- Social innovation associated with diversification of the workforce was not well understood, and there is a need to manage this more effectively.

Culture and values

The sector contains multiple fragmented and incohesive cultures and subcultures that influence relationships – particularly between large companies and SMEs. Rail was described as the most dominant culture in the sector, and a 'family business' culture was prevalent across the sector.

- The greatest area of tension found in relation to culture was between older and younger employees, and legacy cultures.
- How different cultures and values were managed had a large influence on whether there were positive outcomes (greater cohesion, retention and competitive advantage) or negative outcomes (poor behaviours, reduced productivity and lack of retention).
- The prevalence of the family business culture has resulted in strong connections to community in regional, bus and SME organisations. These strengths could be better be leveraged by the sector as a whole.

Where there was change present, team and personal motivations and values were more dominant than company motivation and values, which could lead to less cohesion across the organisation. Values could also be understood and enacted differently, which could lead to misunderstandings and conflict. For example, respect could be seen as not challenging more senior employees opinions even if they were not correct, whereas others who saw it through a more inclusive perspective perceive respect as being able to have an open dialogue regardless of their position in the organisations.

Retaining a diverse and innovative workforce

The retention of women and young employees in engineering and trades is an acknowledged issue across the sector, which has been attributed to poor organisational cultures, mismatching of expectations and an unattractive image (PwC, 2006; BIS Oxford Economics, 2018). The following issues were also found to influence retention outcomes:

- The need to find the right applicant for the job, not just fill the job
- Lack of career progression, particularly with women and those from culturally diverse backgrounds
- The need for more proactive, flexible and inclusive management skills to ensure managers are able to support the differing needs and integration of diverse cohorts
- Effective communication and management of expectations of the current workforce and new employees
- Workplace environments and how well they accommodated different needs
- Prior exposure to the workplace for potential job applicants.

Compared to some older employees, it was widely acknowledged that younger employees had different world views and notions of work, and how they learn and communicate, which needed greater consideration particularly when they first enter the workplace. Older apprentices and employees were reported as being more likely to be retained than younger apprentices. There were also opportunities to leverage talent through other industry networks (e.g., domestic electricians) who had transferable skills and to attract different cohorts using a more attributes-based approach.

Needs and opportunities

Building innovative and inclusive organisations is a long-term proposition and one where progression is not always straightforward. What we have identified is that there has been substantial work undertaken, and that while organisations are developing, there is still considerable work to be done to ensure that they keep progressing.

Key questions for this sector are:

- What skills need to be retained, and what skills need to start being developed for the future?
- What collaborations are needed to address issues such as the development of training, who needs to be part of these collaborations, and who should facilitate them?
- What mechanisms will enable better collaboration between SMEs, SMEs and larger organisations, and between the sector and external stakeholders?

Needs identified included:

- Development of strategic capability in relation to workforce development
- Development of leadership and management skills across all levels of the organisation though professional development in relation to new innovations, strategic planning, and inclusive management and leadership approaches
- Development of flexible and adaptive organisational structures that are responsive to change
- Development of data and monitoring and evaluation of inclusion and innovation across the sector
- New recruitment approaches, particularly in relation to attraction of young people, those from non-traditional backgrounds and attribute-based approaches
- Mechanisms to support better integration and knowledge sharing and transfer between older and younger employees and across the sector
- To develop knowledge sharing and transfer throughout the sector
- Improved development of career pathways and succession planning
- Development of industry specific guidance to support implementation, particularly with inclusion.

Opportunities identified included:

- To develop skills and strategic tools such as workforce profiles and strategic visions to support improved workforce planning and implementation
- To develop specific fit-for-purpose programs to build capability in SMEs that are tailored to their context and needs
- To develop mechanisms that support greater collaboration and knowledge sharing across and beyond the sector to address critical issues and support practice
- To partner with and leverage local research institutes more widely to support locally developed R&D across the sector
- To identify and leverage the strengths and programs that already exist in organisations and the sector
- To identify successful overseas programs that are suitable for the rolling stock sector that could be used or adapted
- To develop monitoring and evaluation in relation to the workforce so progress can be ascertained and more effective planning
- To develop materials and initiatives to support implementation of inclusion and uptake of new technologies in the workplace
- To support R&D and sustainable industry growth through greater collaboration with local research institutes.

Training the future workforce

Training the future workforce

The workforce training review undertook a survey of 25 organisations, a review of documents, an analysis of data collected during interviews during the organisational review, and an economic analysis of apprenticeships.

The current context

The current organisational and economic context of training in the rolling stock sector is fragmented, competitive and diffuse. There are number of challenges including:

- A lack of cohesion between the rolling stock industry, the educational sector and potential future employees
- Little cohesive understanding as to what skills are likely to be needed in response to emerging technologies
- Responses to training issues in rolling stock have been predominantly reactive and organisationally-based, having little impact on the longer term workforce issues for the sector
- Lack of training pathways in trades and concern of a future decline of the number of institutions offering training in areas (such as fitting and turning). There were also concerns about the lack of interest in pre-trades subjects in high school
- The challenge of passing on expertise and highly specific knowledge from older workers to younger workers
- The need to invest in apprenticeships.

There is little information and data available to guide the sector in terms of future planning. Without an understanding of what training is needed, who needs training, how they need it and who should deliver this, it is difficult to move beyond immediate needs and reactive responses.

Training in rolling stock organisations was described as fulfilling the following purposes:

- **Obtaining formal qualifications** – apprenticeships, degrees
- **Reskilling** – the process of learning new skills to perform a different job, or of training people to perform a different job (e.g., training a trades person to become a manager)
- **Upskilling** – improving employees' skills profiles by training them in new skills (e.g., training tradespeople in mobile technologies to access and share information).

The impact of digital and cyber technologies

The global evolution of digital and cyber technologies and advanced manufacturing is changing how people work and the work they do. Although some organisations are changing in response to this, there were indications of a lack of a comprehensive understanding in relation to what this means in terms of future skills and training for the sector. The need to identify niche skills across the sector that will be needed for the next 10 years, and to develop training so that they can be maintained within the sector, was seen as important.

Current provision of training in Victoria

The majority of training was reported as taking place in-house, particularly in trades-based areas. Training delivery was formal (certificate courses, training, degrees) and informal (peer-to-peer learning, mentoring, online learning). In some cases, organisations are registered training organisations (RTOs), and the internal training programs within large organisations are supplemented by external providers.

SMEs were found to be far more reliant on external training providers, but there was little that could be found to ascertain the quality or effectiveness of much of the training provided – particularly in relation to the workforce, and business development and management.

There is a need to build capability in the provision of in-house training, particularly between older and younger employees to support better transfer of knowledge. This means that top-down approaches are unlikely to be successful in this sector, and mechanisms and resources to support broad bottom-up and industry-led collaboration are needed for programs to be effective. It will be important to determine who is best placed to take ownership of this and where responsibility for different areas of training lies across the supply chain.

Constraints

There are a number of constraints resulting from changes in government funding, the current institutional structures (Ai Group, 2019) and competition between providers, resulting in limited resources. There are also a limited number of trainees applying for courses, which could also result in courses being financially unviable for larger training organisations. It was reported that current training products could be inflexible and limited, and there was limited evidence available of effectiveness of some training products.

In terms of the organisations, there are constraints in relation to cost and allocating time to training with current work demands. SMEs also have greater resource and capital constraints than larger organisations, which can negatively impact their ability to enact or uptake appropriate training.

Proactive and strategic responses are needed

Ongoing change is likely for the foreseeable future, and conventional approaches to training can lead to skills gaps that constrain development and competitiveness. There is a critical need for proactive strategic responses that pre-empt and plan for anticipated changes – particularly in relation to emerging technologies, so that a technologically adept workforce is available as new technologies are rolled out across the sector. Different areas of the sector are at different stages of maturity, so flexibility and adaptiveness will be needed in all training programs.

People skills in training packages

Many of the critical training needs emerging are related to people-based soft skills, such as effective communication and management of diverse employees. Although they are included in some of the training packages reviewed, they were mostly electives. Social and technological change also results in new types of risks emerging, requiring new skills such as adaptability and strategic planning to manage this successfully. This indicates a gap in current training and a need to re-evaluate core competencies in training packages.

Training needs are changing

Younger employees have grown up with unlimited access to knowledge through the internet and digital communication, and have different concepts of learning. The emerging learning environment requires non-hierarchical approaches, which enables multi-directional learning within organisations. This means that more advanced communication and people skills are required in order to facilitate effective exchanges between different cohorts.

This fundamental shift in knowledge-generation and advent of digital technology has also resulted in younger employees particularly seeking more collaborative and social learning environments (LinkedIn, 2019). Learning mediums used in training have also expanded to include multiple models of learning that are formal and informal, such as online and digital formats.

Training as a continuous process of learning

For the rolling stock sector to address future workforce needs, it will need to consider training as part of a continuous process of learning. The sector will also need to rethink the current system of education, from formal foundational areas such as degrees and apprenticeships, through to current and future upskilling and reskilling needs. If it is to achieve effective outcomes, consideration also needs to be given to where the myriad of informal and formal training mediums are needed, what is likely to be most effective in specific contexts, and who is best placed to deliver this training. Figure 4 (overleaf) shows a conceptual model of the formal and informal training mediums and knowledge exchange mechanisms that are part of the continuous process of learning.

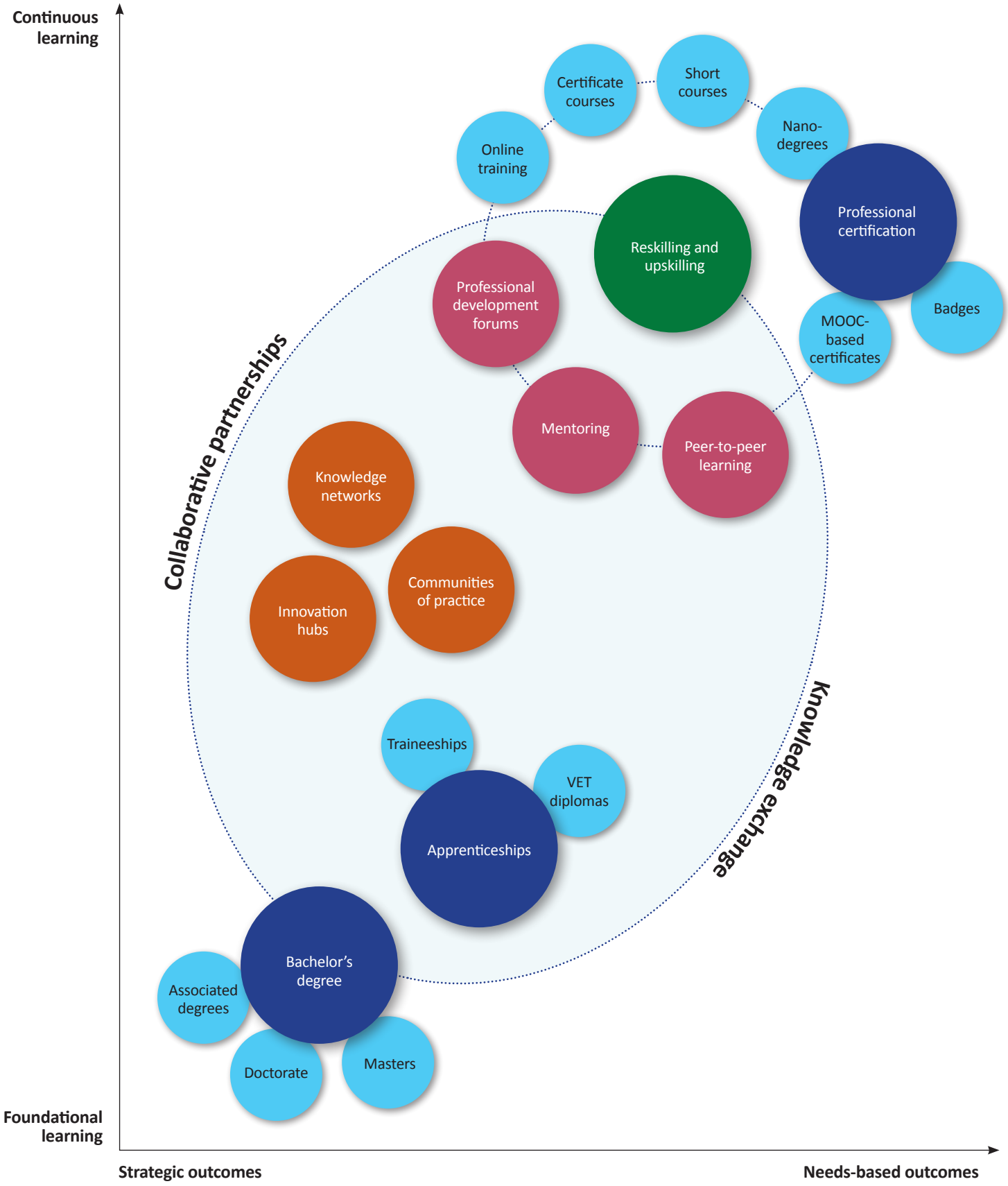


Figure 4: A conceptual model of the formal and informal training mediums and knowledge exchange mechanisms that are part of the continuous process of learning (adapted from Ai Group, 2019)

Mapping future training needs

Specific training needs collected during the study have been collated into two tables, and highlight the differing training needs of SMEs and large organisations. In terms of people and technology skills, there was some alignment, particularly in relation to leadership and blended training that broadened technical skill sets, particularly in relation to apprenticeships.

In terms of SME training needs (Table 1), the key focus of training is to build business capability and technology skills to enable more effective participation in the sector. Larger organisational training needs (Table 2) reflected their current progress in relation to implementation of transformation and workforce development, resulting in more strategic needs, such as training for emerging technologies, and people and organisational management skills.

Table 1: Nominated SME training needs

Category	Training needs	Leadership	Management	General workforce
Business enterprise/ acumen	Business ownership training	✓		
	Intellectual property	✓	✓	
	Financial management	✓	✓	
	Risk management/compliance	✓	✓	
	Contract negotiation	✓	✓	
	Developing effective business structures, processes and systems	✓		
	Strategic planning and implementation of strategies	✓	✓	
	Developing efficient production practices		✓	
	Understanding product value and how to develop a value proposition	✓		
People	Management and leadership training	✓	✓	
	Managing innovation and new technologies	✓	✓	
	Workforce management and development		✓	
	Developing a workforce culture	✓	✓	
	Marketing and client management		✓	
	Leadership – succession planning	✓	✓	
	Management – personnel/workforce development	✓	✓	
	Workforce development – attracting and retaining a diverse workforce	✓	✓	
	Train the trainers for trades people (knowledge transfer)		✓	
	Soft skills	✓	✓	✓
	Effective decision making	✓	✓	
	Digital literacy (e.g., phone apps, iPads in the workplace)			✓
Technology	Cyber and digital literacy – especially in relation to risks	✓	✓	✓
	Innovation and new technology	✓	✓	✓
	Digital marketing and the use of social media	✓	✓	
	Data analysis		✓	✓
	Trades skills training – sheet metal workers, fabricators, welders, boilermakers, fitters, plastic moulding, tool-making, skilled operators, laser cutters, brake pressers			✓

Table 2: Nominated large organisation training needs

Category	Training needs	Leadership	Management	General workforce
Organisation	Challenging conversations	✓	✓	
	Anti-bullying	✓	✓	✓
	Anti-discrimination	✓	✓	✓
	Asset management – long-term management of assets	✓	✓	
	Continuous improvement	✓	✓	✓
	Creating psychologically safe spaces	✓	✓	
	Leadership training – inclusive leadership/adaptive leadership	✓		
	Recruitment training new techniques (e.g., attributes-based recruitment)		✓	
	Safety and compliance (e.g., braking systems, suspension systems, workplace safety)	✓	✓	
	Unconscious bias	✓	✓	✓
	Strategic workforce management	✓	✓	
People	Cognitive flexibility	✓	✓	✓
	Courses in emerging technology for leaders and executives	✓		
	Cultural awareness	✓	✓	✓
	Digital literacy – people now hook up computers and download things from their phones			✓
	Effective collaboration	✓	✓	✓
	Inclusive communication with people who are different	✓	✓	✓
	Active listening	✓	✓	✓
	Implementing diversity and inclusion in an organisation	✓		
	Managing diverse teams		✓	
	Leadership – inclusive and adaptive leadership	✓	✓	✓
	Relationship building	✓	✓	✓
	Training how to socialise new technologies and inclusion	✓	✓	
Technology	Electrical safety around electric vehicles			✓
	Leadership – new technologies	✓	✓	✓
	Electrical systems associated with evolving technology			✓
	High voltage training for mechanics			✓
	Blended electrical, mechanical and emerging technology apprenticeships/upskilling courses for mechanics			✓
	Hydrogen technology		✓	✓
	IT maintenance of digital technology on buses and trains			✓
	Predictive maintenance		✓	✓
	RAMs engineers			✓
	Cyber and digital literacy – digital and cyber risk	✓	✓	✓
	Refurbishment/retrofitting rolling stock assets course			✓
	Managing new technologies in the workplace		✓	✓
	Manufacturing – demystifying electric bus courses			✓
	Train modification course			✓
	Social media and recruitment		✓	

Economic analysis of vocational training

To assess the economics of vocational training for the rolling stock sector, our study assessed two types of cost-benefit models for apprenticeship training (Kuczera, 2017; Muehlemann, 2016; Muehlemann and Wolter, 2014):

(1) A high training cost, single employer model from Germany

(2) A lower training cost, mobile market model from Switzerland.

Figure 5 shows a generic dual-training model. A new trainee will usually start at a low level of productivity, below the cost of providing an apprentice wage and training costs (Part A). Over time, their productivity increases above this level (Part B). By completion (vertical dotted line), productivity levels are anticipated to be 80% or higher than the average qualified person (Part C), but this depends on the degree of difficulty and the ability of the trainee.

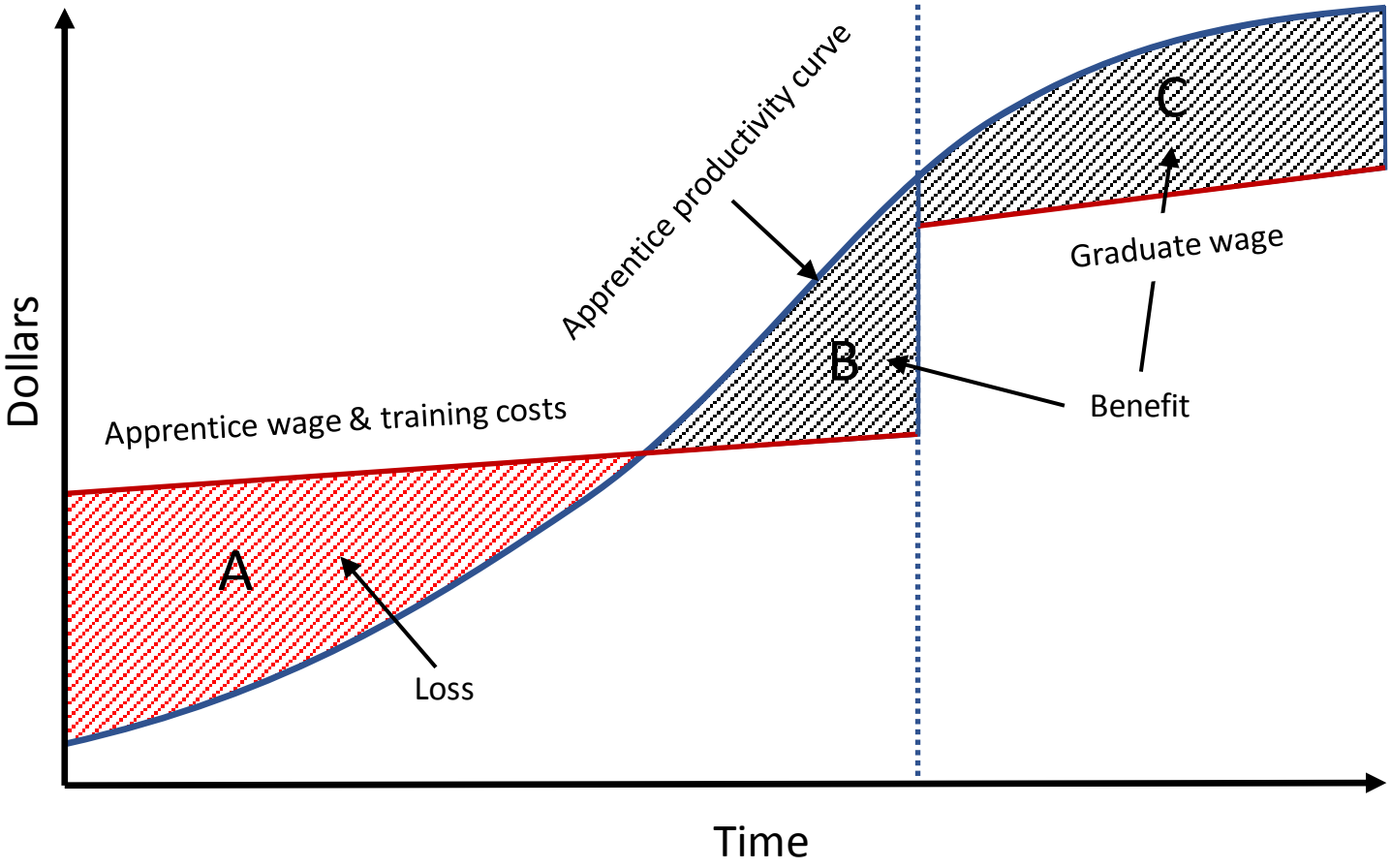


Figure 5: Generic training model for apprenticeships where areas A, B and C measure the balance between costs/benefits of training and employment over time. Adapted from Hasluck et al. (2008)

The role of retention in obtaining benefits

The German model does not provide a net benefit for the employer until after training, so employers need to retain apprentices to gain a benefit. The Swiss model achieves a net benefit before qualification, so the employer does not face a loss if the apprentices are not retained. According to industry surveys for Australia conducted by the OECD (2019), retention after completion is higher in SMEs than larger firms. Taking on a number of apprentices and retaining the most productive ones also provides a longer term benefit. However, all businesses will gain from improved retention.

Completion rates

Completion rates are higher for larger businesses, limiting their losses. They are also higher amongst older people and those with previous education and work experience. They are lowest in SMEs, and group training organisations (GTOs) are somewhere in between. Younger, school-based, rural, Indigenous and people with special needs all have lower completion rates. GTOs have higher proportions of less-advantaged groups, but the proportion of these groups is increasing in all areas (O'Dwyer and Korbel, 2019).

From 2010–13, Victorian completion rates in trades decreased from almost 70% to about 60% for large employers, just below 50% for GTOs, and SME employers just above 40%. When the same demographic mix is represented in all three groups, large employers have 10–15% higher completion than GTOs who perform better than SMEs by up to 5% (O'Dwyer and Korbel, 2019). Low completion rates will be of concern, particularly for those firms with higher training costs, who train to retain.

Almost 20% of non-completion was due to working conditions or issues with the boss or others at work. Non completion may also delay transition to a more diverse workforce (NCVER, 2019). GTOs offer more diverse industry experience and perform better than SMEs on average, particularly with those who have little experience or special needs, offering a potential sector-wide option for improving retention rates.

Quantifying the benefits of training for the rolling stock industry is currently not possible because of a lack of data. A comprehensive assessment would measure the return on investment to key stakeholders for the different types of training being delivered to the rolling stock industry. This would require monitoring training costs and productivity gains, which may be difficult for SMEs.

The relationship between commencements and the economy

The analysis of the relationship between apprenticeship commencements and short- term and sustained economic impacts covering 14 main occupations in Victoria associated with rolling stocks jobs, found the following:

- Trade apprenticeships are more strongly influenced by economic conditions than traineeships, which are more strongly influenced by changes in training incentives
- The removal of employer subsidies from 2012 (except for occupations on the National Skills Needs List [NSNL]), resulted in an estimate average reduction of 1,414 employees in training for each occupation (a total of 20,000). The short-run impact was about 25% of the sustained impact
- Apprentice and trainee numbers can readjust internally to counteract under- or over-training if numbers are out of step with the economy, which shows the importance of integrating training within broader industry strategies
- Compared to other forms of training, apprenticeships tend to recruit younger workers (particularly in trades). Younger workers tend to have a longer working life, providing greater returns to employers for their investment if they can be retained
- The dual structure of on and off-the-job training reduces the need for government investment compared to other forms of solely off-the-job training (such as university degrees or TAFE diplomas)
- GTOs offer the potential for a sector to train a pool of employees who circulate through different firms, gaining experience and offer more one-on-one contact.

Needs and opportunities

Training in rolling stock will need to continually evolve, using a variety of methods to address new skills needs as they emerge. This requires building open and flexible thinking in environments that support ongoing learning in response to current and future drivers of change. It will also need to:

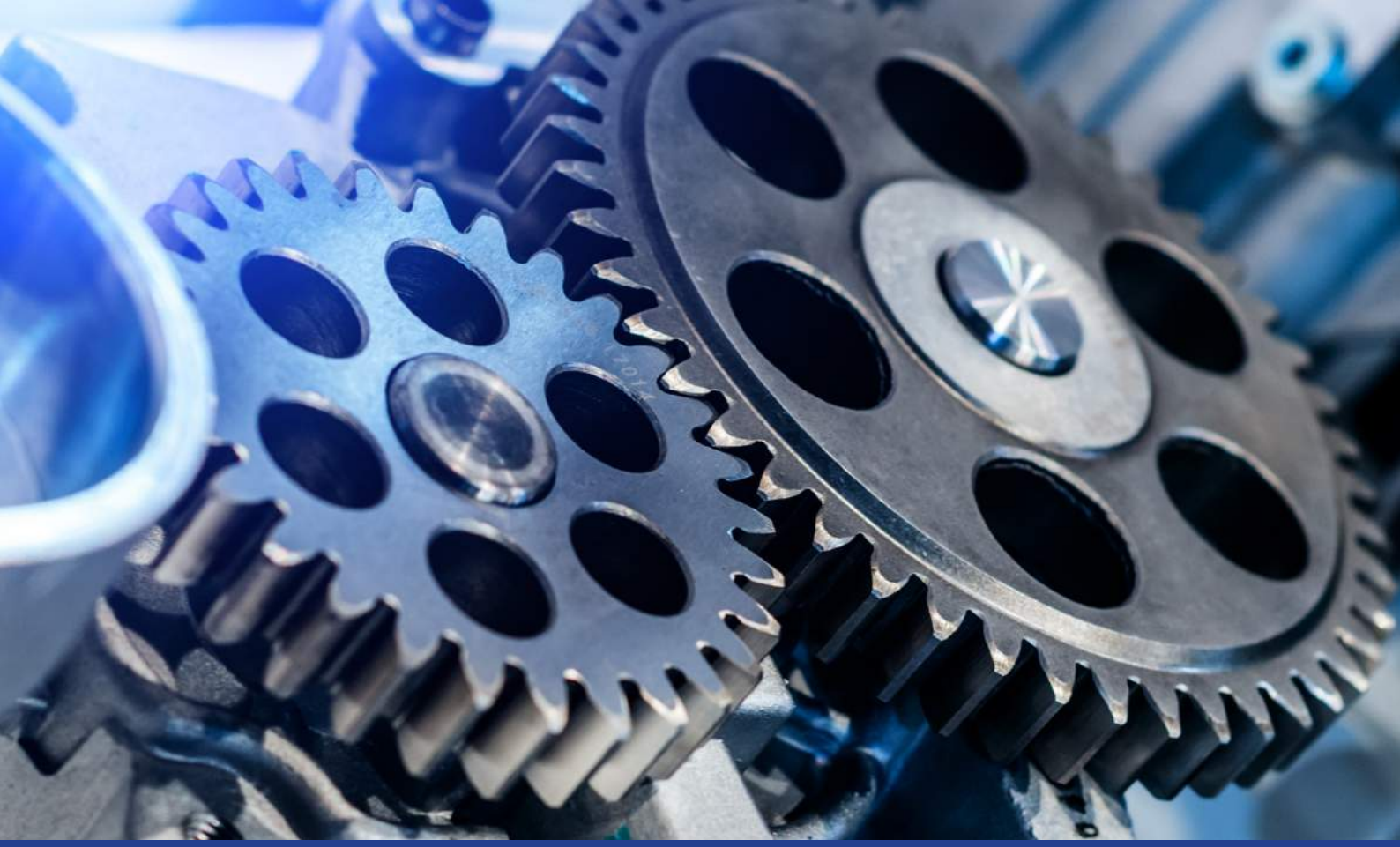
- Meet the future needs of the sector
- Be financially viable for organisations receiving and delivering training
- Be agile, flexible and context-specific
- Build external and internal training capability.

Other needs identified include:

- Ongoing investment in apprenticeship training to ensure a pipeline of skilled workers to sustain economic returns
- Further investigation to understand the economic context of costs and benefits across the full spectrum of training
- Development of evaluation models to assess effectiveness of training
- Collaborations need to be expanded within and beyond the sector to ensure that training meets industry needs, especially with the SME cohort
- Diversification of core skill sets needed in vocational training, especially apprenticeships
- Workforce profiles that encompass the skills that need to be retained, and the skills that will need to be developed, in response to new technologies to support strategic planning of training.

Opportunities identified included:

- To pilot a model for the broader educational system, built from the bottom-up, which is able to adapt to evolving sectoral needs
- Upskilling and reskilling potential workforce entrants who may be the 'right people for the job', but may not have the full skill set to be productive
- Expose potential employees to the rolling stock sector by embedding specific modules related to rolling stock in existing training, higher educational programs and VET courses in secondary education
- Develop additional ways to transfer knowledge and experience, particularly between older and younger employees and between organisations
- Consider setting up a sector-wide GTO that can be tailored to specific skill needs, offering flexibility for SMEs in particular
- Assess training and skills needed for apprenticeships, management of change and to build SME capability
- Consider redesigning apprenticeship training programs to embody what employees will be doing in 5–10 years
- Adapt the generic training model for apprenticeships to evaluate economic outcomes of other forms of training – such as reskilling and upskilling
- Develop monitoring programs to gather the data needed to determine the effectiveness and benefits of different training methods
- To develop workforce profiles and a strategic plan for the sector for the next 10 years.



Economics of procurement

Economics of procurement

The economics of the rolling stock sector were addressed in the literature review and a stand-alone report. In the literature we looked at:

- The current governance arrangements relating to the procurement, maintenance and operation of passenger rolling stock in Victoria's public transport system
- The state of the industry internationally and the main drivers of change affecting economic outlooks
- International trade regulations and economics as they relate to government procurement of rolling stock
- Projected growth in Victoria
- Structure of the local industry.

The economics report:

- Analysed the economic profiles of the national supply chain for rolling stock manufacture, bus manufacture where possible, and public transport on rail and road
- Estimated number of jobs for these sectors and their supply chains
- Estimated potential new jobs created through import replacement and industry expansion
- Assessed selected benefits of social procurement via the creation of new jobs, especially for the disadvantaged
- Outlined the advantages of taking a more applied approach to value-for-money tests when procuring public transport rolling stock.

The economic context of rolling stock

Businesses making and maintaining public transport rolling stock are focused on their bottom line, but the broader market depends on government procurement and how it is regulated. Manufacturers are privately-owned and operators are a mix of private and public corporations operating transport franchises.

Procurement is evaluated on how 'value-for-money' is interpreted by government purchasing board regulations. This interpretation involves a balance between cheapest price through to detailed requirements for social and environmental procurement. A tender for rolling stock can require (or request) minimum levels of local content, specific technologies, employment of disadvantaged people along with set standards and given levels of reliability with equipment. Specific roles and support may also be offered to increase the participation of SMEs. A tender may therefore not be awarded to the lowest bidder, but to the one who offers the best value for money as assessed by the purchasing authority, with regard to the policy objectives applicable to the procurement.

Procurement requesting additional goods or services that the market does not normally supply is referred to as demand-side procurement. Quantifying value for money may require non-market valuation for specific goods and services. Many valuation methods are indirect, needing additional data to measure the wide range of possible benefits. For example, greater health and wellbeing due to improved employment outcomes not only save on health costs, but also increase the welfare of individuals and the community. If the effect is widespread enough, this will eventually flow back into the economy through improved productivity. Energy efficiency and vehicles powered by renewable energy are other examples.

Value chains

Value chains describe the flow of costs and benefits from investment to outcomes. Three are particularly relevant to this project:

1. The manufacturing supply chain for trains, trams and buses with a focus on local and social procurement
2. The education and training value chain for the rolling stock manufacturing, maintenance and operations workforce
3. The public transport operations value chain that provides transport to people of almost all abilities cheaper than private transport, reducing crowding on roads and emissions.

The gold standard is to carry out a full life-cycle analysis to understand likely returns on investment.

The market structure

- In 2016 globally, new rolling stock (train and tram) generated approximately €120 billion in sales (€50–€60 billion) and after service (€60–€70 billion), with original equipment manufacturers (OEMs) capturing about one quarter, suppliers almost half, and operators and third-party maintenance one-quarter (Hein and Ott, 2016). The economies of scale are often small, with vehicle runs similar to those in Australia. In 2015–2016, factory over-capacity was 40% in Europe and the US and 60% in Asia. Market share is increasing for Tier 1 manufacturers who produce systems and components, while the OEM market share is decreasing, except for those at the top.
- Rolling stock is becoming more sophisticated, moving towards a service model that caters to all as a regulated public good, affecting design, and the application of data-rich systems in design, inter-modality, operation and maintenance. Technological innovation provides better service and reduced costs, especially in maintenance, service continuity and preventing unscheduled outages (UITP, 2019). Condition-based maintenance could save 10–15% of the total maintenance cost and is feasible now; prevention could save another 5–10% but needs development (Stern et al., 2017).
- In Melbourne, trains and trams are projected to take most of the projected growth in commuter traffic, with overall capacity being dictated by the capacity to run services for the morning peak. By 2031 this may increase by 90% from 2016 levels, with new acquisitions of trains, trams and some buses anticipated to service this (PTV, 2016). More modest growth in interurban commuting is expected.
- In Australia, the market structure of rail manufacturing between large Tier 1 businesses and smaller Tier 2 and 3 SMEs is unevenly distributed. Tier 1 businesses accounted for 10% of the firms who generate 88%, leaving the remaining 90% of mainly SMEs earning a total of only 12% (Rail Manufacturing CRC, 2017). This gives them a limited financial capacity for innovation and skills training. Most SMEs (a decade ago 90% of small and 85% of medium businesses) are Australian-owned (ACIL Tasman, 2011).
- Nationally, in 2016–17, the rail rolling stock manufacturing sector in Australia had a total production of $3,016 million, and employed an estimated 4,370 people directly with 4,555 in the supply chain. This includes freight and passenger, trains, trams and maintenance. For rail passenger operations, $4,937 million of total production employs over an estimated 27,000 people directly with about 6,000 in the supply chain. Bus manufacture is over $600 million nationally, and road passenger transport (bus and tram) produces over $5,700 million and employs over 48,000 people nationally. Roughly 25% of manufacturing and 30% of operations occurs in Victoria.

Rolling stock supply chain and employment

The employment benefits of local procurement were calculated using the national economic input-output tables for industry, and matching those with employment survey figures. We calculated three types of job, direct and indirect in the supply chain, and induced from additional household expenditure, for the following results:

- Rail rolling stock manufacturing is capital intensive. The number of jobs created by every additional $1 million investment at current import levels is estimated to be 3.5, with 4.4 jobs created with 100% locally produced trains, and around 1.2 jobs with fully imported trains (Figure 6, overleaf).
- In the supply chain, replacing imports in capital-intensive manufacturing would produce an estimated 1.2 to 1.5 jobs per $million, but advanced manufacturing produces 3.1 to 5.3 jobs per $million. By carefully targeting the labour-intensive and advanced manufacturing parts of the supply chain, local employment can be maximised.
- These figures are highly conservative. We compared them with a similar US study that modelled passenger rail cars (Pollin et al., 2015). Allowing for exchange rate differences with the US$, they estimated about 50% more jobs in the supply chain and for employment induced in the community through additional wages being spent. If we had access to similar data for trains, trams and buses, instead of national average data, our jobs estimates would be higher.
- For other parts of the sector, every $1 million in added production would add an estimated 9.3 jobs for rail transport, 6.6 jobs for motor vehicles manufacture (we could not calculate this directly for buses) and 14.7 jobs for road passenger transport (buses and trams).

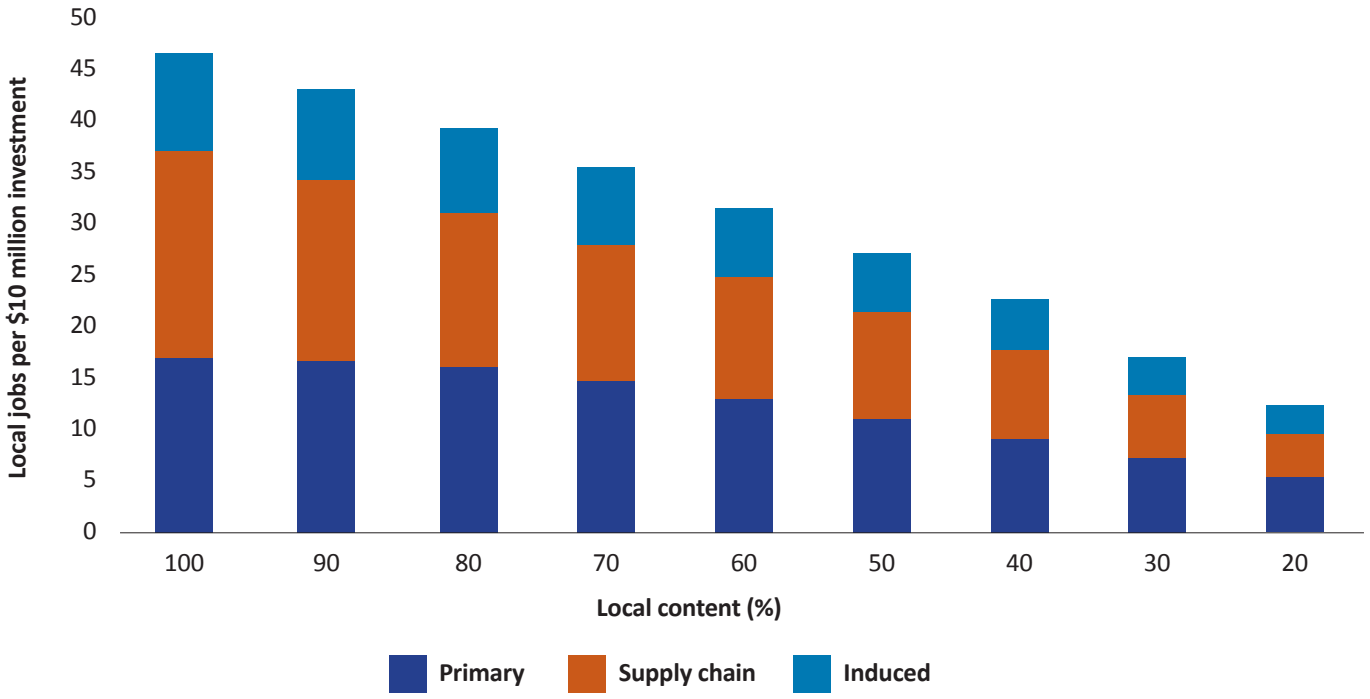


Figure 6: Estimated primary, supply chain (intermediate) and induced employment for nationally averaged patterns of imports in the rail rolling stock manufacturing sector

Innovation benefits

Local procurement fuels innovation if businesses have the capacity to improve their products using new technology. A complex supply chain is also more resilient, and able to serve a broader range of industries (e.g., for public transport, defence, renewables and mining), using that network to increase the reach of innovation. This will also increase the need for upskilling. Under international trade law, procurement strategies allow some government support for SMEs to assist them in adopting new technology and developing new skills and products.

Social and environmental benefits

We estimated selected welfare benefits from social procurement on health and wellbeing. Physical and mental health and wellbeing improve when people move from unemployment into jobs. We estimated a health benefit over three years of $7,300 to $13,500 per person using differences in mental health data between the employed and unemployed. Alternatively, if everyone's health was improved by 5%, the benefit would be about double. Potential direct savings include social security (Newstart $12,732 pa), community support costs and reduced healthcare expenses.

Training also provides social benefits to the economy. Trade training costs to the applicant range from about $4,500 for Certificate III in electrical trades to $15,000 for Certificate IV in engineering. Compared to the above benefits, public investment in training will readily pay for itself, while providing additional benefits to the trainee and employer.

The allocation of risk and responsibility

Consultation with industry suggested that contract risks were being passed down through the supply chain that were not commensurate with the value of goods and services being produced, making participation in the rolling stock sector uneconomic and too high risk.

Needs and opportunities

Although we were unable to fully test the benefits of import replacement, the combination of additional employment on production levels, social returns to the community and the benefits identified in the organisational and training areas, suggests there are opportunities within the supply chain to increase local content producing a net return on investment – with 90% to 100% not out of the question. However, further investigation using data sourced from the local supply chain would be needed to identify the scale of return for a given investment. The potential benefits of strategic investment in the education and training value chain, tied to productivity improvement, greater levels of inclusion and to social procurement also need to be assessed, and there is very little data available in that area.

Needs include:

- Development of a more comprehensive value-for-money test that incorporates social and environmental returns
- Sectoral profile including the scope, capability and capacity of rolling stock
- Sector-specific data, particularly in relation to the distribution of employment throughout the supply chain
- Clearer allocation and transparency of risk and responsibility, especially those relating to contracts
- Targeted communication and provision of information that is accessible for supply chain organisations
- Communication and collaboration with potential supply chain participants early in the procurement process.

Opportunities include:

- Development of working partnerships that support the growth of local supply chains and economies
- To gain economic efficiency through a more ordered procurement process
- To improve social and environmental outcomes through the procurement process
- To provide better mechanisms to support provision and uptake of new technologies, particularly for SMEs
- To develop a comprehensive approach to evaluating the social and environmental benefits generated by procurement and their impact on local economies.

Conclusion

The rolling stock sector in Victoria is at a pivotal point in its development, and the current context opens up the opportunity to revitalise the workforce and sector. As the sector is a sum of its parts, it is only by all of these parts working together that it can achieve meaningful outcomes. It will need to become an innovative and inclusive sector, and form alliances that are able to collaborate effectively for the longer term. This will not necessarily be a comfortable process, as it will require reconciliation of aspects from the past and the formation of new identities. How successful the sector is will depend on whether organisations embrace change, how well they are able to collaborate and form working partnerships with those within and outside the sector, and whether the mechanisms needed to support this are properly resourced.

Our assessments in these areas revealed the following overarching opportunities across all areas:

1. To develop profiles in the following areas:
   - A sector profile to support economic planning
   - Workforce profiles that consider future skills needs and technological changes to support the organisations in building a future pipeline of skilled workers, development of training and engagement with potential jobs seekers
   - Community profiles to support better matching of potential job seekers to available jobs and training.
2. To develop baseline data in all areas reviewed at organisational and sector level, and in relation to potential job seekers, to support more effective planning and implementation, and monitoring and evaluation of progress.
3. To undertake comparative studies of best practice examples of policy development and application to drive innovation (e.g., benchmarking key industry metrics from other OECD economies).
4. To develop a future vision of what the industry wishes to become that is informed by industry to support transformation, strategic planning, and attraction and retention of the future workforce.
5. To develop mechanisms, structures and processes that enable and encourage collaboration and healthy partnerships that in turn enable knowledge exchange and flow of information between organisations, government and external stakeholders.
6. To better leverage Australian research institutes collaborations to support the growth of R&D across the sector as a whole.
7. To develop strategic planning and identify resources to support initiatives that build capability and initiatives that pertain to building the future workforce.
8. For more effective understanding and management of risk associated with workforce, contractual and transformation agendas.

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