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## **TRANSPORT AND LOGISTICS CENTRE (TALC)**

Formed in 2003, The Transport and Logistics Centre (TALC) is a Commonwealth and NSW Government initiative aimed at building capability in the Transport and Logistics (T&L) sector, including road, rail, maritime, aviation and logistics.

Building capability refers to creating a capacity in the T&L sector to analyse the present business environment, develop future business strategies, provide the knowledge and systems to support the strategies and generally have the best combination of people, processes and innovation to be world's best at what we do.

The need to build such capability extends from a number of key challenges currently facing the T&L sector. Such challenges include:

- The loss of intellectual property, corporate memory and talent due to the ageing workforce demographic
- The need to raise the profile of the sector to attract and retain young people, offer them careers and interesting work
- The need to promote and support innovation at every level, including strategies for culture change, new technologies and better processes
- The need to provide leadership in all areas, including safety and security matters, work organisation, skills, knowledge management, general management and long term productivity.

## **LEARNING PATHWAYS**

Pathways are frameworks for learning that offer industry endorsed life-long learning opportunities. Pathways deliver seamless articulation in learning for employees.

“Articulation” is the capacity for participants to enter the learning pathway at various points of entry. In many learning pathways, entry will be at the school level. Students may be engaged in study that is directly and/or indirectly related to a vocational outcome or is being undertaken to prepare the student for entry to higher education, apprenticeships or other employment opportunities.

Entry will also be applicable at the vocational level and at the tertiary level. Students may undertake learning as part of an apprenticeship, traineeship or as part of the curriculum at university. Learning pathways allow unfettered progression from school to vocational training (including agency registered training organisations) to higher education with courses on each pathway provided by specially selected “best-of-breed” providers endorsed by industry.

## **RESEARCH ON RAIL LEARNING PATHWAYS**

Alaak and Kwong <sup>1</sup> have undertaken significant research into learning pathways in Rail. Their research “was conducted as part of Rail CRC Project 62 in an attempt to identify existing gaps in the provision of training and education from railway-operation and engineering workers in Australia”<sup>2</sup>.

The Research report was released in December 2002 and provides detailed review of “Railway Engineering pathways and programs currently available in Australia and the UK at the Trade, Para-professional and Professional level.”

The major findings of their research were:

- Railway engineering training and education at the trade and para-professional levels are currently shared by major rail operators and private providers. A comprehensive database on the providers and courses exists, which shows that the VET sector has little involvement with training for the rail industry to date.
- There is little offering of railway engineering courses at the undergraduate level by Australian Universities. In contrast, course-work based Bachelor and Master degrees in railway engineering exist in several overseas countries.
- While competencies and national curriculum have been defined in the areas of railway operation and civil infrastructure, the engineering aspects of railway operation has not been defined in some technical areas. For example, in areas such as rolling stock engineering, track electrification and railway signalling, the rail industry train and recruit tradespeople using generic engineering and electrical curricula, supplemented with in-house courses. There should be an advantage to the rail industry if a national set of competencies could be developed in these areas.
- Apart from one case in railway operation, there is an absence of formal pathway for trade level employees within the rail industry to advance their skills and obtain qualifications beyond AQF 4 level through courses. There is a need for long-term workforce planning for the rail industry.

## **DEVELOPMENT OF RAILWAY SIGNALLING LEARNING**

Since Alaak and Kwong released their Research report, significant developments have occurred in Railway Signalling. A number of courses have been developed as a result of an initiative between the Rail CRC and the Central Queensland University (CQU). CQU now offers a Graduate Certificate in Railway Signalling and a Graduate Diploma of Railway Signalling. "The program is targeted primarily for recent (within 5 years) graduates of Bachelor of Electrical Engineering programs. Candidates who do not meet the above requirements but have at least 5 years of work experience in the appropriate field and show learning maturity and capability may be accepted on the recommendation (in writing) of their employer."<sup>3</sup>

The Graduate Certificate and Graduate Diploma provide a connection between trade level qualifications and post-graduate qualifications. This connection is somewhat 'circuitous'. Trade level employees are able to move from signal electrician to signal engineer through the acquisition of skills provided in-house. The following section details an example of an employee who moved from signal electrician to signal engineer.

## **CASE STUDY OF A LEARNING PATHWAY PURSUED IN RAILWAY SIGNALLING**

### **CASE STUDY – EMPLOYEE 1 (E1)**

E1 joined the Rail Industry in 1980 and commenced an apprenticeship to become an Electrical Mechanic. State Rail was his employer. In 1983 E1 qualified as a Signal Electrician. To become a Signal Electrician, E1 completed his apprenticeship as an Electrical Mechanic and learnt on-the-job to the point where he undertook a ‘Board’ examination. The examination consisted of two, four hour written examinations. To pass these examinations, E1 had to achieve a result of a minimum of 75%. E1 then spent eight hours before a ‘Board’ of two Signal Engineers. This was a pass/fail oral examination.

E1 was then a qualified Signal Electrician. Over the next fifteen years, E1 progressed through a number of positions, gaining experience and undertaking a series of more responsible roles. In 1999, E1 sat and passed the ‘field signal engineers’ examination. This examination was administered ‘in-house’ and it had – like his previous examination – a requirement that he obtain a minimum of 75% in this examination. The examination consisted of two, three hour written examinations followed by an interview – oral examination – conducted by the Signal Standards area. The Principal Signal Engineer and a Standards Engineer conducted the oral examination. As a result of this process, E1 was accredited by his employer and recognised as a Field Signal Engineer.

To arrive at the point where E1 could undertake the examination to become a Field Signal Engineer, he acquired the necessary knowledge on-the-job. E1 reports that this learning pathway is still in place and that five qualified Field Signal Engineers became accredited in February 2005. From 1999 onwards, E1 has performed the role of Signal Asset Engineer. As a Signal Asset Engineer, E1 is responsible for the asset management of the signalling system. This includes the scoping of ‘renewals’ work, writing asset management plans and developing strategies for the renewal and maintenance of signalling equipment. Signalling equipment includes points, signals and train stops. In addition to this work, E1 also undertakes incident investigation into derailments, Signals Passed At Danger (SPADS) and signal irregularities. E1 works closely with Professional Engineers in the development of new technologies.

E1 reported that there are very few Professional Engineers ‘in the field’. Most Signal Field Engineers have come through the learning pathway that E1 described. To maintain and develop his knowledge in Railway Signalling, E1 participates in bi-monthly conferences conducted in-house by Signal Engineers. With the encouragement of line management, E1 has undertaken courses in asset management, project management and financial management. These courses were short courses offered by external training providers. E1 is also keen to pursue Institution of Railway Signal Engineers (IRSE) accreditation.

E1 discussed the level of skill shortages that are present in the Signalling discipline. He noted that there has been an underemployment of Professional Engineers over the last ten years. This has led to a shortage of Professional Engineers. He described an ageing workforce and was concerned that there appeared to be a lack of succession planning. He believed that there had to be more graduate employment. He commented that the Rail Industry suffered from an image problem. With the

Australian Rail Track Corporation (ARTC) playing a more prominent role in NSW, a number of employees who had taken redundancy from Rail Infrastructure Corporation (RIC) were now contracted to ARTC and some were working as contractors for companies providing services to RailCorp. E1 believed that ARTC didn't have to worry about training people up. E1 also noted that a number of employees are critical in Signalling and that if they departed it would leave serious holes in the organisation. He was aware of worldwide shortages for signal engineers, signal electricians, trade and para-professionals.

E1 was of the opinion that learning was left to managers to co-ordinate and that there was a perceived lack of co-ordination of learning and development. He also highlighted difficulties with re-certification of employees and that re-certification was often undertaken well outside the timeframes set.

## **CASE STUDY OF AN EMPLOYEE WORKING WITHIN THE OPERATION AND MANAGEMENT OF A RAIL SIGNALLING PATHWAY**

### **CASE STUDY EMPLOYEE 2 – (E2)**

E2 has worked in the Railway Industry for over thirty (30) years. E2 began his career as an apprentice and acquired engineering skills on-the-job and by acquiring post-trade qualifications. For a number of years he has been responsible for the learning and development of apprentices, trades people, para-professionals and professional within the field of railway signalling. E2 considered how best to improve the current management and operation of learning and development in the areas over which he exercises responsibility.

He believes there needs to be formal recognition of the skills and qualifications of employees who progress through the electrical trades to become signal electricians. He suggested that employees should have a 'work book' that would accompany them throughout their working lives. This book would record all qualifications that the employee obtained practical skills demonstrated and the equipment on which employees had demonstrated their competencies (ie. a Skills and Qualifications Workbook). Rail companies would be partnered with academic organisations. This would overcome the present situation where a number of skilled employees do not have a comprehensive set of documented skills and qualifications. In a world where mobility of employment is now common, it is not appropriate and ethical for an employee to be unable to possess such a documented history of achievements and capabilities.

Regarding the management of apprentices, E2 saw a benefit of all apprentices being managed centrally. Centralised management would overcome the situation where a number of apprentices have 'slipped through the net'. E2 also noted that the school curriculum should contain a higher standard of mathematics. He noted that a number of potentially good apprentices struggle with the necessary mathematics within the electrical trades. It is not uncommon for new apprentices to be given 'crash courses' in mathematics related to the electrical trades to bring them up to an acceptable standard. E2 pointed to the fact that of a group of 380 applicants for apprenticeships, only 38 or 10% passed the maths test.

E2 described the range of courses that are carried out at the training facility where he is employed. He noted that the railway signalling courses require a further 18 months following a four-year electrical trades certificate course. The 18 months of post-trade certificate training is organised in blocks of 1 or 4 weeks. E2 noted that new national competencies require the development of training manuals and that these are currently being prepared. Signalling will be recognised within these national competencies. In-house experts are employed at the training facility. All of these personnel have extensive practical and theoretical knowledge and experience. E2 expressed the view that overseas signal electricians would require an investment of some 12 months post-employment training.

This would be required to enable the overseas signal electricians to gain the appropriate skills and knowledge on the equipment in the NSW Rail Industry. Signal electricians from other jurisdictions within Australia would also require additional training to become familiar with NSW signalling equipment and signalling systems. A period of 8-9 months was considered appropriate. E2 also noted that a submission was under consideration to enable apprentices to gain knowledge on current equipment and systems. He mentioned that there had been a rationalisation of the number of signalling systems employed in the NSW environment and that more electronics were being seen in the signalling environment. This meant that the signalling trade is going to have to be refined. There is a need to make sure that when new pieces of equipment are coming on line, that equipment needs to be put in the training area and that courses need to be developed to keep pace with technological change.

Post-apprenticeship training needs to be in place at an appropriate level and frequency to ensure that re-accreditation occurs every three years. Currently, there are no refresher courses in place to bring people up-to-date with new equipment. There are examples where there is a lack of contemporary skills and knowledge kept in place. One mechanism that could work would be the use of 'roving trainers' to go out into the field to keep skills up-to-date. Half-day courses could provide training on-site between peak hours.

Mentoring was seen as being of great value. One approach could be to utilise senior staff approaching retirement. As the employees neared retirement, they could spend an increasing amount of time mentoring staff. This initiative would need to be undertaken without financial loss to the employees concerned. Any reduction in conditions of employment for potential mentors would act against a take-up of mentoring positions. E2 suggested that the rail industry was not good at 'selling' itself to potential apprentices.

## **FACTORS IMPACTING ON A LEARNING PATHWAY IN RAILWAY SIGNALLING**

Critical shortages of Railway Signalling Engineers have been the subject of reports in Australia and the United Kingdom. Athol Yates from Engineers Australia alerted the engineering community to shortages from at least 1999. The Guardian Newspaper highlighted similar shortages in the United Kingdom in 2001 and the publication "New Civil Engineer" reported on shortages in 2005. This impacts on the Australian environment by limiting the pool of Signal Electricians and Signal Engineers available

from overseas. The effect of this is to make it extremely difficult to immediately fill existing gaps in the Australian Rail industry. Australian Rail operators have confirmed they have a looming problem with railway signalling engineering numbers. In addition to this, there was a reduction of the numbers of Signal Electricians and Signal Engineers that began in the 1980s. This was as a result of deliberate decisions taken to restructure government departments and dramatically reduce the numbers of employees in the Rail Industry. This led to a reduction in the numbers of employees who received access to apprenticeships and graduate employment. The public sector was the main driver of apprenticeship and graduate employment in the Rail industry. A further contributing factor was the move away from defined benefit superannuation. Defined benefit superannuation was a 'tie that bound' employees. This was replaced over time with less generous schemes that encouraged mobility in employment.

To address the shortages that now exist within the Rail industry will take time. Employers need to examine the environments within which learning and development is conducted. Policies and practices that impede the successful development of a greater number of Rail Signalling employees need to be identified and removed. Inefficient policies need to be replaced with policies that foster greater levels of involvement. This includes employment policies that can operate to impede the progress of employees undertaking Rail Signalling careers. These sorts of considerations need to be undertaken in a very robust manner.

## **CASE STUDY OF A 'THEORETICAL' EMPLOYEE WHO MOVES THROUGH THE 'IDEAL' RAILWAY SIGNALLING LEARNING PATHWAY**

### **CASE STUDY – EMPLOYEE 3 (E3)**

E3 undertook vocational education training (VET) in years 11 & 12 of his high school education. He sought and obtained curriculum advice in his early high school years. His parents encouraged him to study English and Maths at a level that would enable him to choose from a wide range of career options. E3 obtained a solid pass at the conclusion of his high school studies. He secured an apprenticeship with a railway company. He studied on-the-job and at a Tertiary and Further Education (TAFE) College. He emerged with an Electrical Trades Certificate.

At work, all the work he undertook and the skills he acquired were noted in his Skills and Qualifications Workbook. This document was a permanent record and 'travelled' with him throughout his career. It highlighted the equipment that E3 worked on and noted that he was competent to undertake a range of tasks on nominated equipment. Having completed his on-the-job training E3 was assessed by a Board of Examiners who worked at the Railway Company that employed him. His qualifications were recognised by the Institution of Railway Signalling Engineers (IRSE). He was now recognised as a Certificated Railway Signalling Engineer. E3 decided, after three years working as a Certificated Engineer, that he would like to undertake further studies that would enable him to become a Professional Engineer. He saw that a 'bridging course' was available and he enrolled in this course, with the support of his employer.

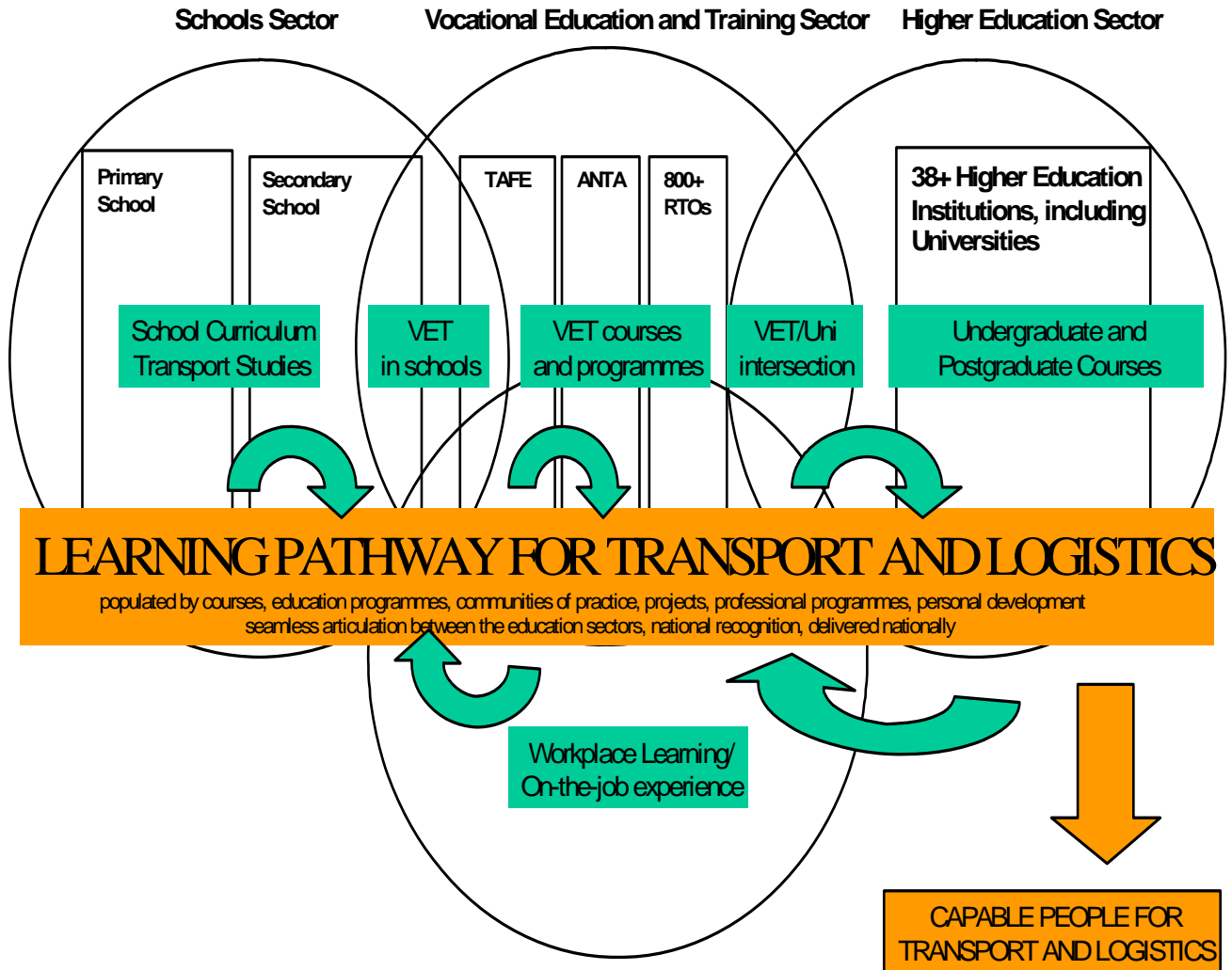
The Rail Co-operative Research Centre (CRC) had developed the course. The course was taught under licence at a number of tertiary institutions in Australia. The bridging course led E3 to be able to enrol in a Graduate Certificate of railway

Signalling Engineering. He enrolled in and successfully completed the Certificate in Railway Signalling and then he completed the Graduate Diploma in railway Signalling. E3 was able to enrol in these courses because the tertiary institution recognised his prior learning and his current competencies. His employer supported the Graduate Certificate and the Graduate Diploma and he was assigned a mentor who was on hand to assist E3 throughout his tertiary studies. E3 sought and obtained a range of positions in the rail industry. The roles he undertook were evaluated by a job evaluation methodology that recognised the value of his technical skills. Ten years before E3's normal retirement date, he was asked if he wanted to spend time mentoring the next generations of Railway Signalling Engineers. He jumped at the opportunity to pass on his extensive knowledge. E3 maintained the rate of pay he was receiving prior to his mentoring role. As the years passed before his retirement, E3 spent an increasing period of time mentoring younger employees. E3 became, in effect, a senior trainer and his skills were kept up-to-date throughout the last ten years of his employment. After 'retirement', he regularly returned to undertake mentoring tasks. He would spend a couple of days each week mentoring younger employees. His employer was extremely pleased to offer him the role of consultant mentor.

## **LEARNING AND DEVELOPMENT PATHWAYS**

The following diagram describes a learning pathway in Transport and Logistics. Learning and development outcomes occur throughout the life of a participant on the pathway. The diagram details the interactions that occur between the Schools sector, the Vocational Education and Training Sector and the Higher Education Sector.

# Learning and Development Pathways



## **RAILWAY SIGNALLING LEARNING PATHWAY AND CAREER STREAMING**

The following diagram depicts the range of careers in Railway Signalling, together with the learning outcomes that are required in order to work in Railway Signalling.

There are multiple entry points along the pathway. Entry onto the pathway can begin with students in school undertaking a course that equips them for future entry into Railway Signalling. Students undertaking secondary education can participate in Vocational Education and Training (VET) in Schools programmes. After completing secondary school, possibilities exist to undertake trades-based courses through a range of apprenticeships and traineeships.

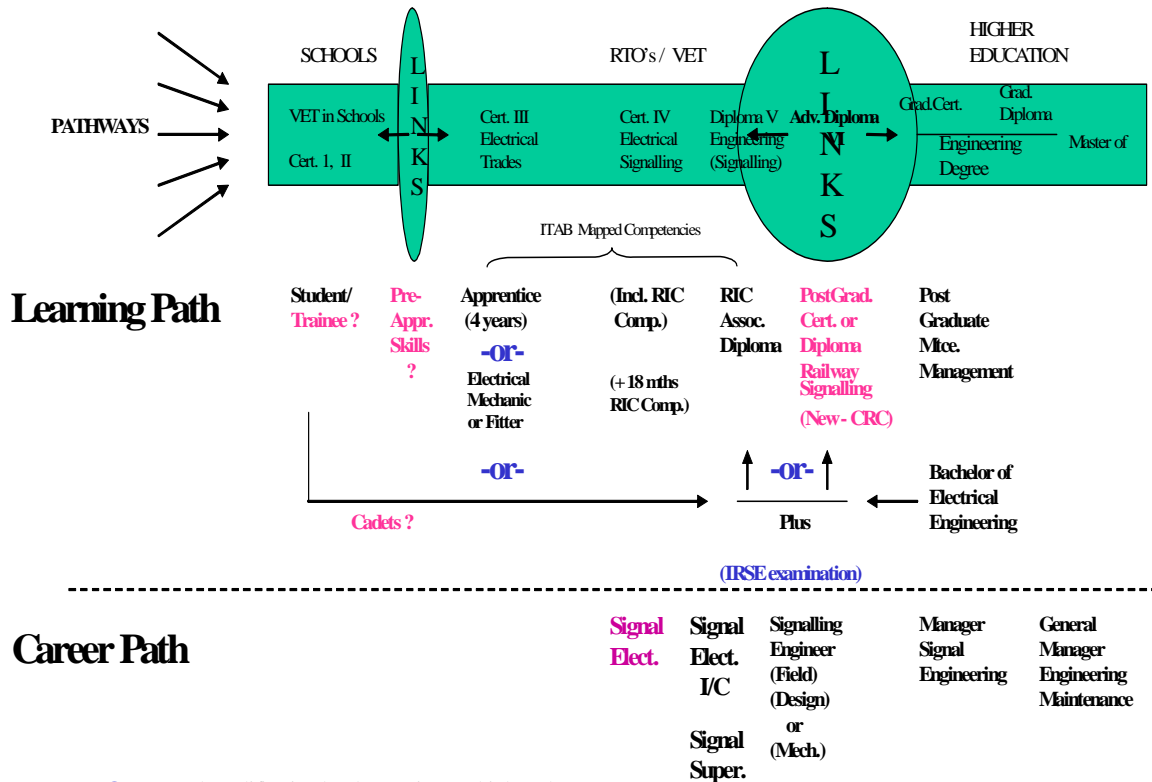
Students can undertake tertiary education and enter the Rail industry as a graduate engineer. Graduate engineers can acquire signalling skills. Employees who enter Railway Signalling via an electrical apprenticeship can obtain recognition as engineers through on-the-job learning and internal assessment.

The development and implementation of a Graduate Certificate and a Graduate Diploma in Railway Signalling has added to the range of learning tools available to rail employees. The addition of these two courses has enabled employees who do not possess an undergraduate degree to undertake the courses. They do this by demonstrating they possess the skills and experience necessary to undertake the courses.

Skill acquisition and career paths connect with one another. A career stream that affords employees appropriate career outcomes as they transit the learning pathway supports a well-planned learning pathway. Workforce planning supports the learning pathway. Employees who obtain nationally recognised learning qualifications are able to be employed in Railway environments in Australia and overseas.

## SIGNAL TECHNICIANS → ENGINEERS

### PATHWAYS & CAREER STREAMING



**NOTE:** Each qualification level comprises multiple pathways

**PATHWAYS PLUS:** *Creating the opportunity* for clearly articulated, accredited and recognition based advancement in careers through learning and development

### NEXT STEPS – PARTNERSHIPS BETWEEN TALC, LEARNING PROVIDERS AND INDUSTRY STAKEHOLDERS

There are some positive signs within the Rail industry. The industry has identified the need for greater numbers of apprentices and graduate employees. Working to increase those who are capable of entering the ranks of Railway Signalling requires multiple initiatives. It is important that all industry stakeholders understand that initiatives will be required to be undertaken in the short, medium and long-term. Quite simply, there are no quick fixes.

Increasing the profile of careers available in transport and logistics is being undertaken. This can be enhanced by employers in the Rail industry, providing a greater level of information on the diverse range of employment opportunities available in the industry. This information is readily available and should feature on all websites. Such information can work to overcome the perception that the Rail industry is not a desirable place to work.

At the school level, the curriculum needs to be reviewed to enable sufficient numbers of potential employees to be equipped with the learning outcomes required to meet the demands of post-secondary and tertiary education. The Rail industry is a significant employer and needs to make its voice heard by Government.

Employers could consider involvement in schemes such as the New Apprenticeships Access Programme (NAAP). This and other schemes that operate to increase the available pool of apprentices are essential if the industry is to attract the numbers of apprentices it requires. Employers need to assess the skill level of existing employees. Assessment can lead to the identification of current employees who can receive training to participate in Railway Signalling.

Governments may wish to determine how best to assist industry to encourage greater numbers of employees to consider careers in Rail Signalling. This could include financial incentives including reduced Higher Education Contribution Scheme (HECS) charges that are already in place in other industries.

For TALC, the opportunity exists for partnerships and strategic alliances to be developed with learning providers and industry stakeholders. These partnerships and strategic alliances would foster improvements in the numbers of people entering Railway Signalling and developing careers in Railway Signalling. The following evaluation criteria have been developed following a substantial amount of stakeholder consultation.

## **PATHWAY EVALUATION CRITERIA FOR SELECTION OF PROVIDERS**

Stakeholders in the transport and logistics field need to be able to determine the value of 'products' and 'services' on offer to them. TALC has developed a set of pathway evaluation criteria, designed to inform the selection process. The criteria are:

1. Demonstrated assessment and seamless articulation arrangements (On-The-Job Recognition of Prior Learning & Recognition of Current Competencies).
2. Clear evidence of partnerships/consortia arrangements in the delivery of all the requirements of the Pathway through all levels.
3. Flexibility in delivery methods.
4. Proven links with industry and industry learner population, understanding and responsiveness to industry requirements.
5. Ability and willingness to link pathway programs with industry RTO programs.
6. Interactivity/connectivity between On-The-Job and Off-The-Job learning.
7. Evidence of the ability to engage with the industry in the design and delivery of learning.

8. Ability and method to deliver required volume alone or in a consortia arrangement.
9. Nominated personnel with appropriate professional and facilitation qualifications and experience.
10. Demonstrated evidence of continual financial viability
11. Copies of required insurance policies for the following:
  - professional indemnity minimum of \$5 million
  - public liability minimum of \$10 million
  - workers compensation

## **TALC INITIATIVES**

The following initiatives are either in train or proposed for further TALC work.

- Convene a Joint Industry Reference Group (JIRG) to advance the current and future TALC Railway Signalling initiatives, and;
- Promote the idea of a national learning pathway in railway signalling amongst operators, governments, unions and the workforce;
- Explore curricula with educational authorities to promote the teaching of mathematics and English to equip potential apprentices with appropriate standards of literacy and numeracy;
- Work with industry to promote the increase of apprenticeships in Transport & Logistics;
- Explore the potential for Group Training Companies to assist in increasing the numbers of apprentices in Transport & Logistics;
- Work with educational partners to address learning gaps that act as impediments to employees progressing in Railway Signalling. Specific work to encourage existing employees with trade qualifications to develop their skills and become Signalling Engineers;
- Produce an agreed national learning pathway in railway signalling through the industry stakeholders by the end of 2006.

The first proposal is to convene the Joint Reference Group (JRG). An indicative date for the first meeting is Tuesday July 5<sup>th</sup> 2005. The JRG will consider responses to the discussion paper and establish a timetable for the implementation of the suggested initiatives and others that may be the subject of agreement at the initial JRG meeting.

Following a consultation period, a consolidated document incorporating comments and suggestions will issue from the TALC. Comments on the material contained in this discussion paper are welcomed. Please address comments to Dr. Daryll Hull at [dhull@talcm.com.au](mailto:dhull@talcm.com.au)

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<sup>1</sup> Alaak, Bull and Kwong, Ken: Project 62 – Pathway – Promotion and Development of Formal and Post Service Technical Training and Education Opportunities for Railway Industry Employees: Research report reference 02/02: Railway Engineering pathways and programs currently available in Australia and the UK at the Trade, Para-professional and Professional level.

<sup>2</sup> *ibid* – Executive Summary page 2

<sup>3</sup> Rail CRC, Central Queensland University (CQU) information on the Graduate Certificate in Railway Signalling and Graduate Diploma of Rail Signalling. [www.railcrc.cqu.edu.au](http://www.railcrc.cqu.edu.au) Rail CRC is the Cooperative Research Centre for Railway Engineering and Technologies.