Review of delivery of the Certificate III Electrotechnology (Systems Electrician) program in order to improve pass rates in Electrical License assessment.

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Abstract

With Australia's workforce rapidly ageing, the cost to business and industry as a whole can become enormous, especially when the numbers of trained electricians becomes one of negative growth. An investment in the Industry's future was made with the advent and implementation of Training Packages however, government incentives and industry endorsement have only partially addressed critical issues related to the effective delivery of training programs, especially in the traditional trade area of Electrotechnogy. In the Electrotechnology Industry, the demand for licensed Electricians is expected to remain high, well into the future. However, a significant number of apprentices fail the license assessment for Electrical Mechanics at their first attempt. This raises serious concerns from both employers and training providers. The research group from the School of Infrastructure, Electrotechnology and Building Services is overseeing a project that will provide a detailed analysis of the requirements and application of the external assessment for Licensed Electrical Mechanics. This information will support a process of improving delivery techniques, assessment tools and methods as applied to Certificate III programs for licensed electricians. The project grew from concerns raised about the poor performance of individuals undertaking the licensing assessment at the end of their training program.

Introduction

This project involved the collection of information related to the performance of apprentices who have attempted the Victorian state licence assessment for Electrical Mechanics. This external assessment is part of the application process for an A Class Unrestricted Electricians License. This License is required by state law to work as an electrician.

All apprentices who participated in this project have completed a Certificate III program for licensed electricians. The Certificate III program for licensed electricians has been delivered as part time attendance over the first three years of a four year apprenticeship. Presently up to 55% of apprentices fail the state licence assessment for Licensed Electrical Mechanics at their first attempt.

The intention of this project is to create an improvement in the performance of apprentices who attempt the state licence assessment for Licensed Electrical Mechanics.

The information has been collected by interviewing a representative group of apprentices who have recently completed the state licence assessment for Licensed Electrical Mechanics. This group will include apprentices both successful and unsuccessful in their first attempt.

The interviewing process is based on a specific set of questions. The questions used enabled the collection of current opinions and observations regarding the state licence assessment for Licensed Electrical Mechanics.

The information collected has formed the basis of a detailed analysis of the requirements and application of the state licence for Licensed Electrical Mechanics. The information from the analysis will support the process of identifying specific actions to improve delivery techniques, assessment tools and methods as applied to the Certificate III program for licensed electricians.

Literature Review

In 2001, a National body, the Electrical Regulatory Authorities Council (ERAC) established a national electrical licensing policy.
In summary the specified requirements of a licensed electrical tradesman are:

- Achievement of specified Essential Performance Capabilities – registered training organisation must deliver the necessary training and assessment services and the apprentice must achieve the 66 specified Essential Performance Capabilities as listed on the Electrician Capability Requirements.
- Application of "Capstone Assessment" to each apprentice – registered training organisation is to apply a quality assurance "Capstone Assessment" that tests the apprentice toward the end of training, to confirm that he/she has attained the most critical of the "List of Essential Performance Capabilities Requirements for Licensed Electrician".

The format of the capstone assessment is a combination of written and practical assessment covering 32 of the 66 specified Essential Performance Capabilities. The 32 items assessed are nominated as critical items.

www.erac.gov.au/index.html

In Victoria, to gain an Electrician's Licence in Victoria, Energy Safe Victoria (ESV),
-an apprentice electrician must complete a four year contract of training as an apprentice electrician
-the training must include at least 12 months experience in carrying out electrical installation work
-an apprentice electrician must hold a Certificate III in Electrotechnology 'Systems Electrician'.
A final assessment (e.g. capstone assessment) must be conducted within this qualification under the auspices of Energy Safe Victoria

If the registered training organisation awarding the qualification has not conducted final assessments under the auspices of the Energy Safe Victoria then apprentices will also need to successfully complete the Licensed Electricians Assessment in accordance with the Electricity Safety Act and the Electricity Safety (Installations) Regulations 1999.

Currently, to meet the requirements of Energy Safe Victoria and the Electrotechnology Training Package, all registered training organisations have made arrangements with the Energy Safe Victoria for their apprentices to undertake the Licensed Electricians Assessment in the final year of their apprenticeship as part of the process and requirements of gaining the qualification. The Electrotechnology, Printing and Information Communication Industry Training Board conduct the Licensed Electricians Assessment on behalf of the Energy Safe Victoria.

The Licensed Electricians Assessment is a combination of three separate assessments, sat at three different times:

- Safe Working Practice for Electricians (SWP)Assessment
- Licensed Electricians Theory (LET) Assessment
- Licensed Electricians Practical (LEP) Assessment

Eligibility to sit for practical examination:

- Satisfactory completed off the job requirement
- Satisfactory completed profiling for 2 competencies (Install/ terminate low voltage cable, Test apparatus and circuits) – wide spread of work and supervised work

The apprentices must pass all above three assessments within three years of their first sitting of the Safe Working Practice (SWP). The Safe Working Practice (SWP) must be passed before attempting the other License Assessment components.
To satisfactory pass the Safe Working Practice (SWP) the candidate must attain a 75%, and all 3 tests of Licensed Electricians Assessment must be completed within 3 years of attempting the Safe Working Practice (SWP) for Electricians Assessment.

http://www.electroskills.com.au/electro/lem.html

Under the Electricity Safety Act, apprentices are viewed as licensed electrical workers so that they can carry out electrical work under effective supervision. The Electricity Safety Act deems apprentices to be licensed for the duration of their contract of training and for a three month period after completion of their contract of training.
The extra 3 months allocated is to insure that the apprentice has sufficient time to apply for a license after the contract of training has been completed. The Licensed Electricians Assessment can be undertaken by an apprentice prior to, or after, the completion of the contract of training.

Apprentices who successfully complete the Licensed Electricians Assessment are then eligible to apply for an 'A Class' electrical licence.
However, the apprentices who fail the Licensed Electricians Assessment are not eligible to re-sit the assessment for a further three months in accordance with the Electricity Safety Act.

If the extra three months period allocated after the contract of training has passed then these apprentices are no longer deemed to be licensed and it is no longer legal for these apprentices to undertake electrical installation work. This has significant implications to both the employment of the apprentice and the workplace activities of the employer.

An apprentice who has not successfully completed the Licensed Electricians Assessment within the period of training and the allocated three extra months will be

required to apply for a supervised workers licence. This licence will enable the apprentice to carry out electrical installation work under the effective supervision of an A class licensed electrician. The supervised workers licence is issued for a period not exceeding 3 years. The apprentice can then continue to pursue a successful completion of the Licensed Electricians Assessment.

Chief Electrical Inspector (issue 19) newsletter

Electrical Regulatory Authority Council published paper "ERAC Licensing Policy 2001",

This paper has supported the claims that there is increased difficulty for Licensing Authorities to assess whether a person meets the 32 critical performance capabilities for licensed electrical tradesman. These 32 critical performance capabilities define the basic competency requirements of a licensed tradesman.

Previously the objective of assessment was met through the application of standardised training -'the common core curriculum' which was assumed to be delivered to electrical apprentices. A successful completion of 'the common core curriculum' was the basis of issuing an electrical license. In Victoria, an external licensing examination was additionally applied by the regulatory authority as a final check.

The Certificate III 'Systems Electrician' Qualification is delivered as both on-job and off-job training between a registered training organisation and an individual employer under the heading of 'New Apprenticeship'. This training process is set by training package rules.

As training packages are competency-based, proper structuring and recording of on-job competency development, plus control of progression based on results, are important. There has been concern to date about the integrity of both on-job and off job assessments.
The devolution of training design, delivery and assessment to industry has had many positive aspects but has introduced potential problems for electrical licensing authorities. The high level of flexibility makes it difficult to check the apprentice has achieved the required range and level of skill and knowledge.

"Improving the validity of competency-based assessment" by National Centre for Vocational Education Research (NCVER)

The validity of assessment could be one contributing factor effecting the non-completion or poor performance of an electrical trade apprentice. The study on reporting the validity and suitability of an assessment outcome for the Australian environment of competency-based assessment made interesting findings.
The study involved reviewing the literature, reporting on case studies, presenting key findings and recommending a tool to guide assessors.
Several of the findings are reported:

- There was evidence that some practitioners were reluctant to allow any scrutiny of their assessment practices

- The assessment records were not well developed and kept, to the extent that the capacity of the records to be audited was in doubt.
- Participants used ideas of 'recognition of prior learning' and recognition of current competencies' in various ways, indicating that there was no uniform understanding of this area.
- The use of integrated competency assessment' (holistic assessment), while valuable, appeared to raise some issues regarding validity that have yet to be resolved.
- While the issue of grading arose in the course of the study, its role is complex and issues of validity would vary depending upon use.
- One influence on employment and on-job success that also has an impact on validity could not be considered in the study because it appears to be an un-stated factor.

Peter Thomson from National Centre for Vocational Education Research Ltd has commented to this effect on his research paper "Some challenges in the assessment of prior learning".

In some instances, the assessment of prior learning may create some gap between the actual and assumption of knowledge and skills obtained by the apprentice. Therefore, recognition of prior learning RPL may contribute to the reason for student passing his/her Electrical License assessment.
The assessment of individuals applying for full exemption in core competency units creates some issues. To assess whether an individual has met the standards of competence required for an electrician is a very demanding task, because failure to get it right in these cases can have grave consequences. The requirement of validity applied to the work of assessors in this instance is critical.
Once the exemption is granted, it is with the understanding that on-the-job and off-the-job training and experience has been satisfied to the expected standard, but in many instances, the performance objectives of the off-the-job underpinning knowledge and on-the-job workplace and occupational competencies only partly matched each other. Most occupations had particular competency requirements that were not covered by the required underpinning knowledge.

EPIC ITB's first industry Forum for 2005 entitled "Shorter Apprenticeships: Choices and Consequences",

The forum provided discussion between keynote speakers from Office of Training and Tertiary Education (OTTE), Australian Chamber of Commerce and Industry (ACCI) and Electrical Trade Union (ETU) regarding the above issue.

Part of the discussion produced a suggestion that due to a shortage of qualified trade persons in some industries, the on-the-job part of the training and development of competency in the workplace have been affected by a lack of supervision and inadequate monitoring systems for ensuring the training satisfy's the requirements of the relevant training package.
The discussion also emphasised that a clear assessment system is required to ensure industry remains confident that quality arrangements are maintained in the training processes.

Research Method

The research team did not expect the first stage of interviews to provide enough data to enable a complete understanding of the issues being considered. The intention of this project is to create an improvement in the performance of apprentices who attempt the external assessment for Licensed Electrical Mechanics. Our aim is to carry out some actions based on the first collection of information. The expectation is that these actions will create a change in the performance of apprentices. A second collection of evidence will enable the identification of the actions that may or may not have created improvement. This will allow for further analysis of the issues being addressed. This cycle of activity is best accommodated by the process of 'Action Research'.
Action research is described as – 'the undertaking of practice improvement through taking considered action, reflecting on the outcomes, planning and taking more action, and so on.'

Julian Lippi Appendix 2 Action Research Nita Cherry 1999 ISBN 0 86459 020 2

Discussion

The training process experienced by an apprentice electrician can be broadly described as a combination of workplace attendance with time release from the workplace to attend a part time program at an institution registered as a training provider. The overall operation of this training arrangement is set out in the requirements of the 'New Apprenticeship'. The 'New apprenticeship' is a contract of training between an employer and an apprentice. The conclusion of this contract should result in the apprentice obtaining an industry recognised qualification as an electrician. An industry recognised qualification is an achievement of the basic requirements for the trade of electrician.

The apprentices interviewed in the first collection of data were apprenticed in the training system prior to the application of training packages. It should be noted that there appears to be little difference in the outcomes experienced by either training package apprentices or those trained prior to the implementation of training packages. The issue of poor performance by completing apprentices when being assessed against industry standards is evident across both systems of training.

The registered training provider contributes to the training process by being responsible for the assessment of the qualification, the non workplace training and the development of a training plan. The training plan sets out the process and requirements that will lead to the issuing of the qualification. A training plan is an agreement between the employer, the apprentice and the registered training provider. The agreement sets out the actions and processes to achieve the qualification. This document can be reviewed and renegotiated by the signatures over the period of the apprenticeship. This document remains in effect for the period of the apprenticeship and is signed off at the completion of the apprenticeship. The training plan should be capable of allowing for variations in the environment of both the workplace training and the non workplace training.

This research is investigating the issue of why apprentices who have been qualified as electricians by a registered training provider are unable to successfully complete an industry set assessment of the same qualification. The expenditure of resources by all the parties, the apprentice, the employer and the registered training provider should enable the industry set assessment to be passed in the first attempt.

The industry assessment exists because of requirements set by state regulations for electrical wiring work. That is, all persons carrying out electrical wiring work must be licensed by the state regulator. The licence is additional to the qualification issued by the registered training provider at the conclusion of an apprenticeship. The assessment conducted by the Victorian state regulator is to establish the level of skills and understanding of a candidate to, work safely with electricity, ensure electrical instruments are safe, select electrical equipment that is safe and ensure that electrical protection systems operate effectively. The qualification issued by a registered training provider is a statement of a much greater level of skills and understanding with regards to capacity of an electrician.

The establishment of a national electrical licensing policy in 2001 set specific requirements for registered training providers who provided training and assessment for licensed electrical trades. The policy also identified the application of a final assessment 'capstone assessment' to be applied at the end of the training process. The specific requirements for the complete trade are sixty six listed items. Of the sixty six items thirty two are required to be assessed as part of the 'capstone test'. The 'capstone test' is effectively the license assessment as applied by the regulator in the state of Victoria. In some cases regulators from other states accept the assessment of registered training provider as the basis for issuing an electrical trade license.

The overview of the structural processes and policies available to registered training providers, employers of apprentices and apprentices with regards to training an electrical tradesman appear to be sufficient to get the job done. The reality of the results from external assessment show that there is some part or system in the training process failing.

The collection of data from completing electrical apprentices was based around a set of questions. Several of these questions inquire into the expectations an individual has regarding how the training process relates to the assessment. Two other questions investigate what type of training activities have been carried out by the completing electrical apprentice during the apprenticeship both in the workplace and in the registered training organisation.

The questions have been presented to the electrical apprentices as a one to one interview. The identity of the electrical apprentice being interviewed is not recorded with the responses. The responses to the questions were recorded in a written format. In most cases the response is either yes or no. Many of the apprentices when interviewed had other opinions and insights regarding their experiences with the assessment process. The opinions and insights offered by the apprentices are valuable in gaining an understanding of effects that the assessment process has on individuals involved. The information retained for our research was kept as the answers to the written questions. The collected data was assembled and presented graphically.

Our review of the data brought forward the following information. Of the interviewed group approximately sixty five percent passed the assessment at the first attempt. Of the total group forty three percent expected to pass. These candidates had not experienced this type of assessment previously therefore some candidates may have been apprehensive and actually performed better than they had expected.

Two questions were set around the training processes employed over the period of the apprenticeship. Thirty five percent believed that the Registered Training Providers training program helped toward a successful completion of the assessment. Thirty five percent believed that the workplace training and experience helped toward a successful completion of the assessment. From what is stated above sixty five percent of the candidates believe they did not gain any training that enabled a successful assessment outcome.

A further question established what practical activities were carried out by the candidates as part of both training program and the workplace training prior to the attempted assessment. These activities are specifically selected because they are part of the assessment process. The results are set on the following;

Test an electrical installation	
Done at the Registered Training Provider	42%
Done in the workplace	8%
Done in both of above	50%

Install Consumers Mains	
Done at the Registered Training Provider	15%
Done in the workplace	35%
Done in both of above	50%

Find defects in an electrical installation	
Done at the Registered Training Provider	27%
Done in the workplace	18%
Done in both of above	55%

Install an Multiple Earth Neutral system	
Done at the Registered Training Provider	40%
Done in the workplace	30%
Done in both of above	30%

Another question established what equipment and industry documents were utilised by the candidates as part of both training program and the workplace training prior to the attempted assessment. The equipment and industry documents are specifically selected because they are part of the assessment process. The results are set on the following;

Use the Code of Practice for Safe Electrical Work	
Done at the Registered Training Provider	65%
Done in the workplace	20%
Done in both of above	15%

Use the Electrical Safety Regulations	
Done at the Registered Training Provider	68%
Done in the workplace	20%
Done in both of above	12%

Use the standards AS/NZ 3000	
Done at the Registered Training Provider	35%
Done in the workplace	-----
Done in both of above	65%

Use the standards AS/NZ 3012	
Done at the Registered Training Provider	35%
Done in the workplace	10%
Done in both of above	20%
Never	35%

Use the standards AS/NZ 3008	
Done at the Registered Training Provider	45%
Done in the workplace	----
Done in both of above	55%

Use an Insulation Resistance Tester	
Done at the Registered Training Provider	42%
Done in the workplace	----
Done in both of above	55%
Never	8%

Use a Kyoritsu Insulation Resistance Tester		Use a Multimeter (Digital or Analogue)	
Done at the Registered Training Provider	55%	Done at the Registered Training Provider	18%
Done in the workplace	----	Done in the workplace	----
Done in both of above	28%	Done in both of above	75%
	17%	Never	7%

Conclusion

The conclusion of our research needs to be considered with the following information as a basis for what the 'New apprenticeship' provides as a teaching and learning process. Typically a four year apprenticeship provides approximately six thousand, three hundred and eighty four training hours. Of these training hours eighty three percent are utilised at the workplace and seventeen percent spent attending a registered training organisation.'

The data collected has shown a large proportion of apprentices do not believe they are fully prepared for the assessment. A training process should provide most apprentices with some degree of confidence prior to the assessment. An improvement to the training provided by the registered training organisation would be to create more assessment activities modelled on the regulators assessment.

The results for the questions covering practical activities show that the bulk of the experience of the apprentice is done at the workplace. This activity would occur without the need for the apprentice to respond in either written of verbal form. In most cases the apprentice could verify the outcomes of the activity with fellow workers. In the assessment all activities are recorded via some means and the apprentice is in an environment which is quite formal in its application. The assessment process covers a number of activities over approximately four hours. With most apprentices being about twenty years of age this environment would be different to their general workplace. An improvement to be considered is that the training conducted at the registered training organisation includes assessment events that model the same process of the external assessment.

The results for the questions covering the application of industry documents and test equipment showed that the majority of this activity was carried out as part of the training away form the workplace. The assessment process requires that the application of test equipment and the interpretation of industry documents are demonstrated as part of a complete assessment activity. The training activities within the registered training organisation are not set as complete activities. The improvement to put into effect would be to include applications of this area in all activities.

Overall the data collected indicates that the training process experienced by an apprentice is such that it does not bring together all the aspects of what is expected of a licensed electrical tradesman. A change needs to be implemented to the training experienced to collect and apply the basic skill functions of the electrical tradesman's qualification in each assessment event over the training process.

The majority of the training process is conducted at the workplace with each workplace being a different training environment. Each workplace is difficult for a training organisation to access and to attempt to create change to the apprentices training experiences. The training process that is conducted at the training organisation is the best part of the process to take action on.

At present the training process employed away from the workplace consists of the presentation and testing of 'modules or units'. Success for the apprentice is a pass in a module or unit, with a set of units making a stage. Success for the training organisation is a completed attendance roll with the result marked against an apprentice's name. The overall performance of an apprentice against industry standards is at present not measured or addressed as part of the program.

The action to be taken will be to establish holistic assessment events. Events that include the application of industry standards, test equipment, practical activities with apprentices required to respond both verbally and in writing in the process. These assessment events will occur in the first, second and third stages of the training program. The assessment events will follow the assessment methods employed by the licensing authority assessment. The implementation of the changes described will require a change in approach for both administration staff and program teachers. The results should produce a constant program performance review process across all stages. Teaching staff will be able to monitor the effectiveness of their work in meeting industry requirements by utilising the results of the assessments. Finally when a registered training organisation presents a qualification to an apprentice that qualification will match what industry expects.

Original Research Project

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