Industry Training – Exploring the Data

Learners in tertiary education

This report forms part of a series called Learners in tertiary education.
Other topics covered by the series are access, pathways, support,
participation, retention and qualification completions.

Author:

Paul Mahoney, Senior Research Analyst
Email: paul.mahoney@minedu.govt.nz
Telephone: 64-4-463-2891
Fax: 64-4-463-8713

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1. Introduction

This paper provides a broad examination and analysis of the industry training data between 2001 and 2006, within the context of an exploration of the best methods that could be used.[1] As such, it explores the necessary processes to get to a point from which further research utilising industry training data will be possible, rather than of itself embodying a definitive study of industry training.

The Ministry of Education intends to supplement the regular programme reporting published by both the Tertiary Education Commission (TEC) and the Ministry itself in the longer term, providing in-depth research using industry training administrative data.

To this point, there has been limited publicly-available performance and accountability information on industry training. This is due to a variety of reasons, such as the requirement for administrative practices to mature before data collections can be considered robust. It is generally acknowledged that there are some reliability issues with the industry training administrative dataset. Where possible, the methodology used throughout this examination attempts to correct for data quality issues; however, this is not always possible. Because of this, the findings in this paper (as in any other which uses administrative data as its base) should be thought as more *exploratory* than *definitive.*

The methods used also differ in several important ways from those used by the TEC, for example, to provide baseline measures for '*Investing in a Plan'* progress monitoring. However, they are appropriate for exploratory data analysis. The main intentions are to assess the quality of the dataset; and to identify and explore any discernible patterns, with a view to developing a more complete assessment of industry training completion in the medium term.

The Ministry of Education is responsible for evaluating industry training's effectiveness, particularly in relation to the government's wider goals for education, identified in the Tertiary Education Strategy 2007 to 2012, and the Statement of Tertiary Education Priorities 2008 to 2010.

This first report examines industry training learning in two main parts: what is 'put in', and 'what comes out'; or by both its 'inputs' and 'outputs'. In the case of industry training; 'inputs' refers to data on enrolment and associated programme activity that occurs at the commencement of learners' involvement in industry training programmes, while 'outputs' refer to the circumstances under which learners leave industry training programmes or exit industry training. This report also includes some initial statistical modelling of completions and exits.

The 'input' section provides a picture of enrolments in industry training programmes, describing the key trends, and exploring the key themes of enrolment in industry training programmes. As this is the first of a series of examinations of industry training, the research questions are purely exploratory: *Who enrols? How many? At what level? Are there differences between demographic groups?*

The output section examines the trends from the 'other end' of the learner's journey in industry training, by describing the demographic and other profiles of learners who exit from industry training programmes. The research questions roughly correspond to those posed for the input section: *Who exits successfully? How many? At what level? Are there differences between demographic groups?*

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[1] Where appropriate, for example, for duration analyses, subsequent data extracts have been examined to determine whether findings are borne out by use of wider cohort windows provided with additional years of data.

At this stage, our ability to answer these questions is limited to what it is possible to interpret from administrative datasets. The industry training dataset was designed to monitor some aspects of programme activity and as such, does not adequately describe the whole story. For example, the 'outputs' described in this paper cannot be thought of as 'outcomes', as the analysis is based on specific programme occurrences. We do not currently know what happens to industry training learners once they leave. However, the feasibility of matching various administrative datasets to explore what happens to learners after they leave industry training, and other forms of tertiary education, is currently under investigation.[2]

The results of exploratory data modelling are presented in the final section of the paper. This took the approach of assessing what could be discovered about the factors associated with completion of industry training programmes, given the data limitations. It is acknowledged that further variables are required in order for a complete picture of the predictors of success in industry training to be developed (variables that are not currently available for analysis).

There is a pressing need to understand the industry training data in relation to provider-based post-school learning activity in New Zealand. Industry training is analytically the poor cousin to provider-based tertiary education, the analysis of which is quite advanced and consequently, it is fairly well understood. Industry training is a constituent part of the higher education system in New Zealand, any analysis of which requires understanding of the parts to determine the true nature of the whole.

In summary, this is an exploratory project, covering many facets of industry training: its scope is wide, and because of this, its depth is modest. The density of information provided in this document suggests that its best use is as a reference volume, to inform future research; future publications will examine key aspects of industry training in more depth.

1.1   Industry training

Industry training is formalised learning that occurs within the workplace. It is intended to provide employees with training and learning that is linked to national qualifications through the National Qualifications Framework. It is part-funded by industry, and by government, through the industry training and modern apprenticeships funds.

The Industry Training Act 1992 provides the legislative basis for industry training activity. It provides for the creation of industry training organisations (ITOs), stipulating their purpose and rules of operation. It provides for appropriations of funding from public funds to pay for industry training through Vote: Education. Industry training government funding is administered by TEC and is used to reimburse ITOs who arrange for delivery of workplace-based learning and assessment.[3]

Modern Apprenticeships operate under the Modern Apprenticeship Training Act 2000. It is similar to industry training, except for certain key differences: it is aimed primarily at younger learners; and, there is an additional party to training arrangements, the modern apprenticeship coordinator whose role is intended to coordinate training and maintain relationships between employers and apprentices.

Unless otherwise signalled, 'industry training' refers to industry training and Modern Apprenticeships programmes and learners combined, reflecting the structure of the administrative dataset. The majority of this paper examines data relating to both types of learning, however,

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[2] In this paper, however, a programme 'output' is consistently referred to as a programme 'outcome'.

[3] ITOs do not deliver the training themselves.

section 4.1 relates to Modern Apprenticeships solely. It is intended that subsequent research will explore Modern Apprenticeships (and industry training) in much more depth.

1.2   Current research

Since 2000, workplace learning has grown at a faster rate than other forms tertiary education. Both government and industry have successively expanded their investments in industry training; consequently it now constitutes a much greater part of the tertiary education landscape in New Zealand.

However, there is a paucity of quantitative research on industry training, and there is a real need for more information on the performance of workplace learning and its drivers. Aside from the basic measures provided in TEC's annual monitoring reports, there is little publicly available information.

Some important questions need to be addressed, such as: *who are the learners in industry training in New Zealand? what is the experience of learners in industry training in New Zealand? what factors are associated with success?*

The Ministry of Education intends to address this knowledge gap with a programme of analytical study. Most recently, Ussher (2007) examined the transition of school learners to tertiary education, using the National Student Number (NSN).   When comparing the transitions of learners into industry training, as opposed to other types of provider-based tertiary education, some findings were:

- around 13 percent of school leavers transit directly to industry training (that is, within a couple of years of leaving school). The proportion who transition into Modern Apprenticeships is 4 percent

- males are more likely than females to transit into industry training

- European learners are the group most likely to transit into industry training, over other ethnic groups

- there is no real socio-economic status effect for learners who transit into industry training: there is an even distribution of proportions of learners transiting to industry training across school deciles (used as a proxy measure for socio- economic status)

- learners with higher-level school qualifications tend not to transit into industry training. The proportion of school leavers transiting into industry training reaches a peak for students with a level 1 qualification and then decreases for those with a higher-level school qualification.

There are other sources of New Zealand-based qualitative research on industry training, most notably, those conducted by the Industry Training Federation. Curson (2004) provides a literature review of what makes for effective learning in the workplace, based on interviews with ITOs on the 'influencers' of completions and non-completions in industry training. She relates that ITOs consider that the most common reason for termination of a training agreement is because a trainee moves jobs to a different employer. In this case, ITOs find it difficult to track job-changing learners to record an outcome.

Curson also found that ITOs feel that the majority of influences on non-completions reside with the employer, and are beyond the control of the ITO (some ITOs are beginning to collect specific information about why trainees do not complete their training agreement) such as: size of the enterprise; the value placed on qualifications (in each enterprise, and each industry); any seasonal nature of the type of work within the industry; and the nature of employer/employee relationships.

Retention and non-completion is also thought to be more of an issue for industries which have large numbers of young (15 to 19 years) learners. Proponents of this argument contend that, within these industries (for instance hairdressing and hospitality industries), employees tend to change jobs more often than in others, before they find their preferred employer or career and 'settle'.

Other barriers to completion identified by ITOs (anecdotally) include, for instance:

- lack of quality of on- and off-job training
- cost (to the employer and to some extent, the learner)
- training that does not meet skill needs (i.e. is not relevant)
- lack of support or guidance from ITOs
- unsuitable delivery models.

The quality of training received on and off-job can also affect some trainees' ability to successfully complete their programme. For example, if learners identify training as low-quality and not relevant to their skill needs, learner motivation and enthusiasm to complete will be low. Curson contends that ITOs try to mitigate this effect by maintaining close relationships with tertiary providers, supporting employers to undertake employee needs analysis and arranging or providing training for workplace trainers and assessors.

Overseas studies into the factors relating to non-completion in vocational education and training, involving mainly institutionally-based training, have found a number of associated individual, course and institutional factors: smaller institutions had higher completion rates than larger ones; non-metropolitan institutes had higher rates than metropolitan ones; and industry areas with large amounts of training activity had lower rates of module completion than did other industry areas.[4]

There is a reasonably large body of overseas research on factors limiting buy-in or engagement of enterprises into formalised workplace-based learning systems. Employers already involved in industry training are, of course, probably quite receptive to formalised workplace-based learning, hence their engagement with it. Of interest is whether these factors also affect the success of learners already within the industry training system. Summaries indicate a number of factors limiting businesses' receptivity to workplace training, (for example, Fraser, 2005). These include industry area, age and status of employees, turbulence within the industry, training tradition of industry, educational background of owner, and enterprise location. Australian studies (i.e. Kearns, 2005) have identified that supply-side barriers to enterprise participation include that provision is not sufficiently flexible and is not provided in the forms, times and locations to suit small business.

The present study builds on this information base by exploring the main determinants of completion of industry training programmes, using the information available from the industry training administrative dataset. Before this is possible, a wide examination of the administrative data to identify key trends and themes is required, and is therefore contained within the first sections of this paper.

It is acknowledged that the approach used is necessarily limited: It cannot answer every question we pose, and cannot account for every factor. Using the administrative dataset as the sole source of information precludes the ability to test certain factors identified in research as associated with success in workplace-based learning, such as 'size of enterprise'; and intangible factors, such as 'the value placed on qualifications' by enterprises. The dataset does contain (or allows calculation of) several key learner, institution and programme-related variables, however, such as: age, ethnic group, gender, NQF level, volume of learning (STM), duration, ITO, qualifications and credit

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[4] Victorian Office of Technical and Further Education, 1996, cited in McInnis, Hartley, Polesel and Teese, 2000.

attainment. These are tested for association with 'success' in industry training – in this case, measured as learner completion of industry training programmes.

A major constraint is that information on the content and completion of training agreements is not available: this data is not currently collected. Therefore this study uses programme of study, historically (and currently) the basis of data collections, as the unit of analysis. This provides a useful proxy measure for a completion rate of training agreements, since the learning that constitutes the quantum required in plans or agreements is made up solely of collections of training programmes, and the majority of learners participate in just one programme.

1.3   Data issues

The TEC collects industry training data for the purposes of funding training provision. It has supplied this data to the Ministry of Education, enabling its use within its analytical programme.

As the TEC's data collection and reporting methodologies have been developed primarily for funding and programme monitoring purposes, the structure of the industry training dataset reflects this priority, and may not always fully support a wider analytical examination. This means that it has been necessary to develop a new analytical framework, building on the TEC's approach, but which goes beyond the TEC's methodologies in some places.

The Ministry's analysis is intended to be at the system level; to provide information on broad trends in industry training as a part of the whole tertiary education system, rather than focusing on details that are often monitored in funding regimes. Therefore, information in this report may differ in some places from that published by the TEC in its annual and Baseline Funding reports, for example.

As already mentioned, the current structure of industry training, and therefore the data collection that describes it, does not quite enable analysis of the 'whole' industry training experience to be made easily. Industry training learners sign up to a training plan or agreement with their employer and industry training organisation at the commencement of their involvement in industry training. The TEC does not currently collect training plan or agreement details, and therefore is not able to determine their content, or measure progress towards accomplishment of learning goals set out in agreements. Therefore, it has been necessary to base our analysis at a programme enrolment and exit level, rather than at the individual level.

In places, we have used National Student Number to count the number of unique individuals participating in industry training, and have provided some average measures of key aspects of training for them. Industry training learning consists of enrolment in programmes, made up of unit standards, registered on the National Qualifications Framework. Learners may embark on one, or many programmes in pursuit of their training plan or agreement objectives. Some attempt has been made to generalise about the totality of experience in industry training for learners (such as average numbers of enrolments, credits and national certificates attained per learner); to provide some common learner category information; this is limited, however.

Industry training data includes Modern Apprenticeships learners. These are a subset of the dataset, and are therefore included in all analyses of industry training. Where possible, variables have been disaggregated by 'fund'; the fund identifier in use within the dataset signals activity as 'industry training' or 'Modern Apprenticeships'. Where a fund distinction is not made within the analysis, it applies to industry training as a whole, that is, it includes Modern Apprenticeships.

The TEC regularly publishes data on industry training activity, and it is not the intention of this report to replicate or replace these, but to supplement them by providing an analytical frame from which further research can be conducted. Details of the trends in participation and achievement are also available in the Ministry of Education's *Profile & Trends* publication series, and some tabulations of industry training data can be accessed through the *Education Counts* website.

This report primarily examines the trends of learners who were active within industry training between the calendar years of 2001 and 2006. As discussed, there are two emphases: inputs and outcomes.

The inputs section examines trends for all those who were enrolled and active in a programme during that period (noting that some people in this analysis may have enrolled prior to 2001). For some measures of activity, for example for exit categories (in the outcomes section), it has been necessary to use an alternative method of cohort selection: where this occurs, it has been indicated.

In the outcomes section, trends are analysed for all learners who exited from a programme between 2001 and 2006 (and in some cases, as subsequent data has become available; 2007).

It should be noted that learners may enrol in more than one programme, and they may be enrolled in more than one programme at the same time. For learners who only ever enrol in one programme, the enrolment level analysis will therefore correspond with a learner-level analysis.

A single-prioritised method of reporting ethnicity is used by ITOs, in preference to a total response method. However, as ethnicity and gender variables are self-reports, in practice they may change between enrolments (and reporting events) for learners. Where this occurs, ethnic and gender grouping has been adjusted, under the TEC's reporting rules: ethnic grouping (and gender) data for each trainee has been amended to reflect their last-stated preference for all of their activity.

The data that forms the basis of the analysis in this report is considered to be reasonably indicative of activity in industry training. However, no administrative dataset, such as this, can ever *perfectly* reflect programme activity because of biases inherent in the use of information as the basis to allocate monies. As the data is collected primarily for funding purposes, it is acknowledged that there may be some negative externalities in the data collection that lead to less than accurate reporting of some variables.

Part of the emphasis of this report is to determine the ability of the dataset to provide an accurate picture of what is actually occurring in industry training. There is some concern that the wide variety of processes used by ITOs to collect and submit the data to the TEC means that the data is not consistent, and should not be used for analytical purposes. This analysis assesses this claim, and finds it wanting (with some caveats). Some of the variables are robust enough to be used as indicators of progression through learning, however; such as credit and national certificate attainment.

Statistical modelling accounts for this 'noise', and calculates the probability that the findings are due to chance (such as sampling errors). The fact that discernible, statistically significant, replicable patterns can be found among the data is encouraging, engendering a certain level of confidence that the administrative dataset *is* robust enough to provide us with answers to some important questions.

The extent to which the patterns that emerge are biased by certain administrative behaviours is not known. How much legitimate programme effect is masked by operational programme design and administrative data collection methods? Due to a lack of information, we may never be able to determine the answers to these questions absolutely, but analytical design can be tailored to try to

take these problems into account to a certain extent: where possible, they are controlled for or eliminated from this analysis, when identified.

Perhaps the best example of this within the dataset is the programme output variable. We are not entirely sure of its legitimacy as an indicator of success in industry training. It is used as the main possible indicator of positive progression through learning, yet it must be used with caution, because of, for example, administrative difficulties tracing 'lost' learners.

Learners are attributed with one of two programme outputs: completion or termination, describing the circumstances associated with their exit from a programme. A 'completion' infers success, while a 'termination' fundamentally infers that the programme criterion for success was not met, for whatever reason. A challenge in education policy-making is to address the causes of non-completion in publicly-funding education programmes to improve programme efficiency, but if we do not know why learners are failing, or even if they *really are* failing when they are assigned a 'termination', our options for addressing the problem are limited.

We are forced to rely on anecdotal evidence to provide context, such as Curson's finding that some terminations can be attributed to the learner changing jobs. ITOs' subsequent inability to track learners down to determine an outcome when this happens, means that programme completions may be consistently undercounted. Not enough is known about the administrative practices of the people who record and collect the data: in the absence of further information, we do not know what proportion of terminations reflect the change of job scenario (which policy makers can probably do little or nothing about – people will always change jobs, and enterprises do suddenly cease trading). We think we can be sure that many or most of the 'unknown exits' are due to job changes, or where employment suddenly ceases, but we really do not know how many terminations are legitimate (where a learner does not change jobs, stays with the same employer, yet does not complete their programme), and how many aren't.

In any case, a termination in this situation (or any other) does not mean that the learner, and by extension the employer through the use of accumulated skills, has not gained something from the investment in workplace learning. It also does not mean that the learner does not go on to re-enrol and finish their course of study within the scope of their new employment: but the statistics would attribute this to the negative outcome category.

There are other examples of data limitations: these are discussed within the analysis and statistical modelling sections of this paper, where appropriate.

1.4   Key findings

For simplicity's sake, the key findings are set out in point format.

Input section

1. The majority of learners in industry training participate in just one programme.

2. Pasifika learners are more likely than European learners to study in programmes bearing a lower credit load, and are less likely than European learners to study in programmes with a high credit load. European and Māori learners share a similar credit load enrolment distribution profile.

3. Māori and Pasifika learners are more clustered within in narrow range of ITOs than other learners. Similarly, clustering also occurs between different age groups and genders.

4. Female learners are more likely than males to be studying in programmes with a lower credit load.

5. Older learners are more likely than younger learners to be enrolled in programmes with a lower credit load.

6. Pasifika learners are more likely than European learners to be studying in programmes at lower levels of the National Qualifications Framework.

7. Generally, there is a correspondence between NQF level and programme credit load: the higher the NQF level of a programme of study, the higher its overall credit load.

8. Māori and Pasifika are more likely than European learners to be studying at a lower volume of learning (STM) per year.

9. Pasifika and 'other' ethnic groups are less likely than European learners to be enrolled in long duration programmes.

10. Younger learners are more likely than older learners to enrol in longer term programmes.

11. Females are more likely than males to enrol in short duration programmes.

12. There is uneven enrolment distribution between ethnic groups, ages and gender groups for each ITO.

Outcome section

Credit attainment

1. The average credit attainment for all learners leaving programmes is 35 credits.

2. The average number of credits attained per learner is 53 credits.

3. The average credit attainment at programme exit steadily increased from 2002 to 2005; and remained constant in 2006.

4. European learners gain more credits on average than Māori or Pasifika learners.

5. Females consistently earn fewer credits than males.

National Certificate attainment

6. On average, a rate of 0.3 national certificates are attained *per programme exit* (or a certificate is attained for around one third of all programme exits).

7. The average national certificate attainment is 0.37 *per learner*. The average rate of national certificate attainment is higher for European learners than for Māori or Pasifika learners.

8. The average national certificate attainment is higher for females than for males.

9. The certificates attained by European learners are more likely to be at higher NQF levels, than those attained by Māori or Pasifika learners.

10. Limited credit programmes are utilised as stand-alone programmes, and mostly do not lead to eventual national certification.

11. Older learners are more likely than younger learners to attain a national certificate.

12. Young learners earn certificates at lower NQF levels than older learners.

Duration of learning

13. About half of learners spend 12 months or less in each programme. A further 28 percent spend 13 to 24 months in each programme.

14. Females exit programmes after a shorter duration of time than males.

15. Younger learners are more likely than older learners to exit programmes after a shorter period of time.

16. The maximum available window of data (6 years) suggests that, in total, the average amount of time spent in industry training by learners is 21 months: for females, it is a little over 17 months; for males, a little under 23 months.

Programme outcomes

17. Thirteen percent of programme exits are not explained (outcome is unknown).

18. The observed probability of attaining a programme completion is 0.33, or 33 percent: one third of programme outcomes are coded as 'completions', meaning that the intended training was achieved. For a number of reasons, this may be an undercount of the true proportion of exits that are completions.

19. An estimate of a five year completion rate for industry training learners (for learners commencing in 2003 for the first time) is 35 percent, which is comparable to the completion rate for students in Level 1 to 4 certificates in provider-based learning.

20. The probability of programme completion in industry training is very similar to the probability of qualification completion in comparable provider-based learning.

21. Māori and Pasifika learners are less likely than European learners to attain a programme completion at each programme exit.

22. Fifty-four percent of programme exits end with a 'termination'. A termination code indicates that the learner has left the programme before the requirements of the programme were fully completed. This proportion is higher for Māori learners.

23. A programme is much more likely to be completed if a national certificate has been attained on the programme.

24. Programmes with lower credit loads are the most likely to end with a completion.

25. The more credits that are attained on a programme, the more likely it is to culminate in a programme completion.

26. There is weak relationship between credit load of programme, and the quantum of credits attained on them.

27. Completion is the most likely observed outcome for very short programmes only (3 months or less). For the remainder, termination is a more likely outcome.

28. Female industry trainees are more likely than males to conclude their programme with a completion (0.37 and 0.31 respectively).

29. Younger learners are more likely than older learners to terminate their programme.

30. The gap between programme completions and terminations is closing as the years progress, however, terminations still (proportionally) outnumber completions.

31. Completion is the most likely observed outcome for learners exiting limited credit programmes and supplementary credit programmes.

32. There is a wide distribution of programme outcomes across the different industry training organisations (ITOs). In general, the larger the ITO (in terms of the total number of learners), the less likelihood there is of programme completion at each programme exit.

33. The proportion of exits that are completions is now fairly consistent between Modern Apprenticeships and other forms of industry training.

34. For European learners, the gap between termination and completion of programmes is very narrow; for Māori it is very large (proportionally many more terminations than completions).

35. Female modern apprentices are less likely to end their programmes with a completion than males.

36. Older modern apprentices are more likely than younger ones to complete their programme.

Statistical modelling

37. A logistic regression analysis found that 'ITO' (encompassing ITO, employer and industry effects), followed by duration and volume of learning were the three strongest predictors of programme completion. Type of programme (National Certificate or Limited Credit Programmes) was the fourth and fifth respectively.

38. In the presence of an ITO variable, field of study was the less important predictor. Field of study was relatively important in predicting programme completion, with learners in mixed field programmes the most likely to complete their programme.

39. Propensity for programme completion increased with the levels of volume of learning (STMs). It is assumed that higher volume programmes represent *recognition of prior learning activity* rather than *learning and assessment activity* (no indicator defines this). If so, this suggests that *recognition of prior learning activity* is more likely to be completed than *learning and assessment activity.*

40. Older learners were more likely to complete their programmes than younger learners.

41. There was a location effect, reflecting findings in the overseas literature. Learners in highly populated areas, such as the Auckland and Wellington regions, were less likely to complete their programmes than learners working in other broad regional areas.

42. Ethnicity ranked 11th of statistically significant predictors, while there was a slightly higher probability of completion for females than for males.

43. Previous highest qualification is a relatively unimportant factor associated with programme completion. Learners with prior qualifications acquired at degree level were less likely than others, including those with no previous qualifications, to complete their programmes. Learners whose previous highest qualification was at 5th form or equivalent to 7th form or equivalent were more likely to complete their programme than learners with no previous qualification.

44. There was a small year of exit effect. Taking all these other variables in to account, there is little evidence to support the hypothesis that industry training programme outcomes are improving with the passage of time.

45. The data seems to indicate that learners involved in programmes that include off-job learning components are less likely to complete than those who learn completely 'in-house'.

46. Taking all variables in the model into account, Modern Apprenticeships learners are more likely to complete their programme than industry training learners. This effect applies to a reference category of learners, and needs to be tested on other reference categories to ensure it is a consistent finding.

47. Taking all variables in the model into account, Female learners are *more likely* than male learners to complete their programme. That they are observed to be *less likely* to complete than Males indicates the presence of an external influence, one that has not been modelled.

2. Industry training inputs

2.1 Scale of industry training

The industry training data has been mined to provide further information about the scale and scope of industry training. Counting all learners active between 2001 and 2006, there were:

- 312,719 distinct learners active in total
- 2,013 distinct programmes in operation
- 286,674 programme commencements (programme enrolments)

Figure 1: Enrolments in industry training by ethnic group (2001-2006)
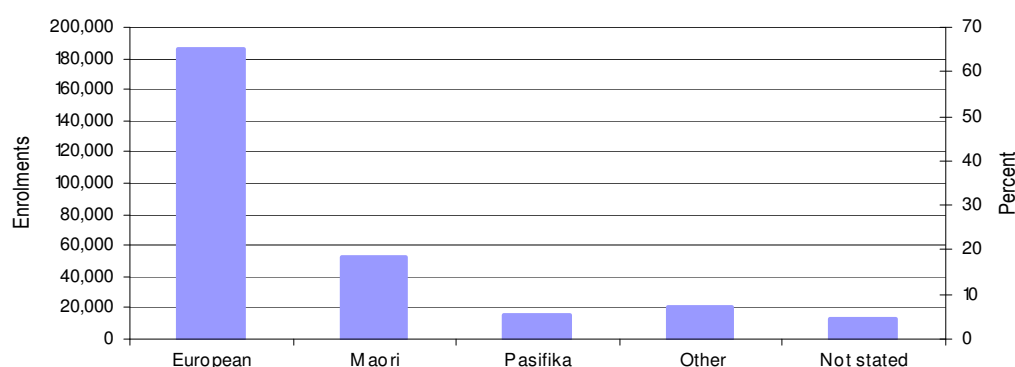
Source: Tertiary Education Commission

European learners account for 65 percent of enrolments; Māori 18 percent; Pasifika 6 percent; 'Other' account for 7 percent, and 'Not stated' account for 4 percent of enrolments in the period.

2.2 Number of training programmes per learner

This section examines the total number of enrolments in programmes for industry training learners who were active within the period. Industry trainees may embark on a number of training programmes in pursuit of the learning outcomes set out in their training agreement or plan. They may be enrolled in one programme at a time, or in more than one programme concurrently. They may also enrol in programmes in series. This measure is the sum of the number of distinct 'programme i.d.s' associated with learners on the database, who were active between 2001 and 2006. It has been assigned as a categorical variable used to describe the learner, rather than the enrolment, and has been used later on in statistical tests to determine the predictors of outcomes.

Analysis of the number of programmes is complicated by an issue with the recording of programme activity. When a programme changes in specification, the TEC will reassign a new programme number, and this is recorded in the learners' record as a new enrolment, in a new programme. The frequency of this practice is not known. This also adds a level of complication to the assignment of completion rates. TEC has developed a methodology to track provider performance for funding purposes that allows for this to some extent, however, this methodology has not been applied to the

analysis in this paper. Notwithstanding this, an examination if the number of programmes by various groups is still valuable.

Between the 2001 and 2006 calendar years, learners who were active in industry training had mainly enrolled in just one programme, but a substantial proportion were involved in 2 or more programmes, in totality:

Table 1: Total number of programme enrolments for learners

Number of programmes	Number of learners	% of total
One Programme	196,875	63 %
Two Programmes	72,501	23%
Three Programmes	24,721	9%
Four Programmes	9,981	3%
Five or more programmes	8,641	3%
Total	312,719	100%

Figure 2: Total number of programmes pursued by gender (2001–2006)
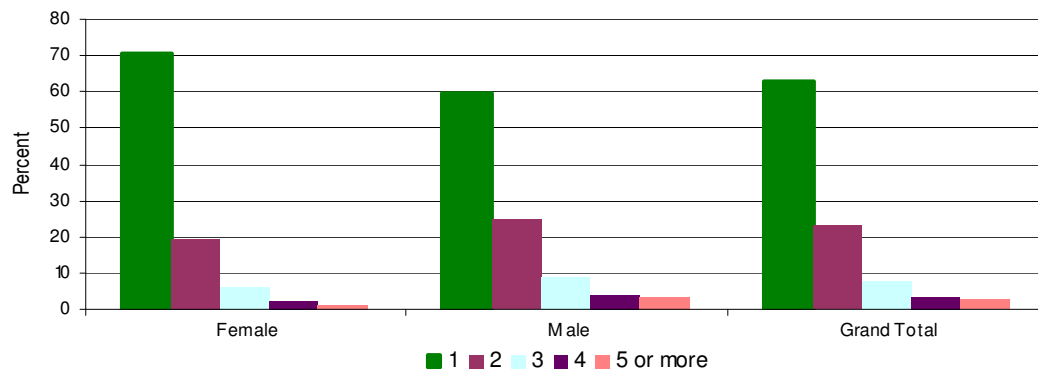
Source: Tertiary Education Commission

Figure 2 shows that women were more likely than men to participate in just one programme (71 percent to 60 percent) during their involvement in industry training learning.

Figure 3: Total number of programmes pursued by ethnic group (2001–2006)
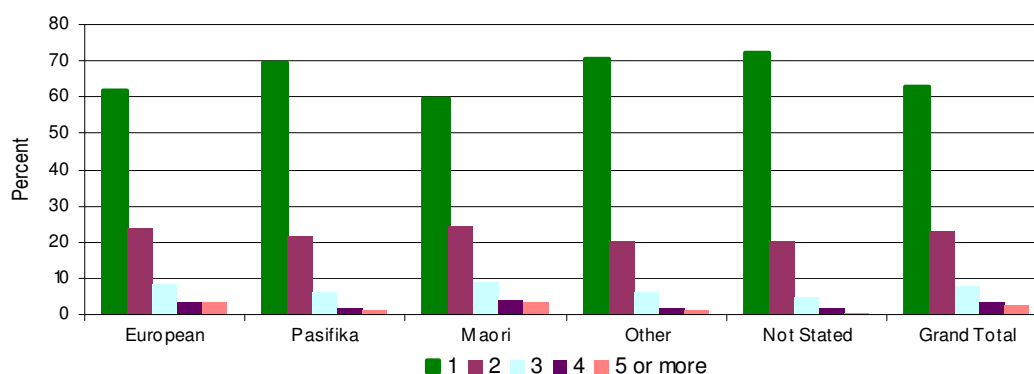
Source: Tertiary Education Commission

Figure 3 shows that learners who identified as Pasifika, 'Other' and 'Not stated' were more likely than European and Māori learners to participate in just one programme during their involvement in industry training learning.

2.3   Programme attributes

This section describes the attributes of programmes, as the previous section describes the attributes of learners. There are five types of programme in industry training:

- National Certificate
- National Diploma
- Trade Certificate
- Limited Credit Programme
- Supplementary Credit Programme.

These are named to describe the qualification they enable learners to work towards. The intended outcomes of each programme are the indicated qualification.[5]

For learners active between 2001 and 2006, enrolments were distributed across programme types as follows:

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[5] For more information on programme types, see *Profile and Trends 2006*, chapter 6 article.

Table 2: Programme enrolments by programme type

Programme type	Number of learners	% of total
Limited Credit Programme	34,665	12 %
National Certificate	247,361	86%
National Diploma	3,169	1%
Supplementary Credit Programme	1,471	<1%
Trade Certificate	8	<1%
Total	286,674	100%

2.4   Credit load per programme

Learners enrol in a number of programmes, and each is assigned its own credit load. This refers to the total number of credits on the National Qualifications Framework that can be achieved in a programme. Each programme consists of any number of Unit Standards, each with an associated credit value.

Figure 4: Enrolments by programme type and credit load (2001-2006)
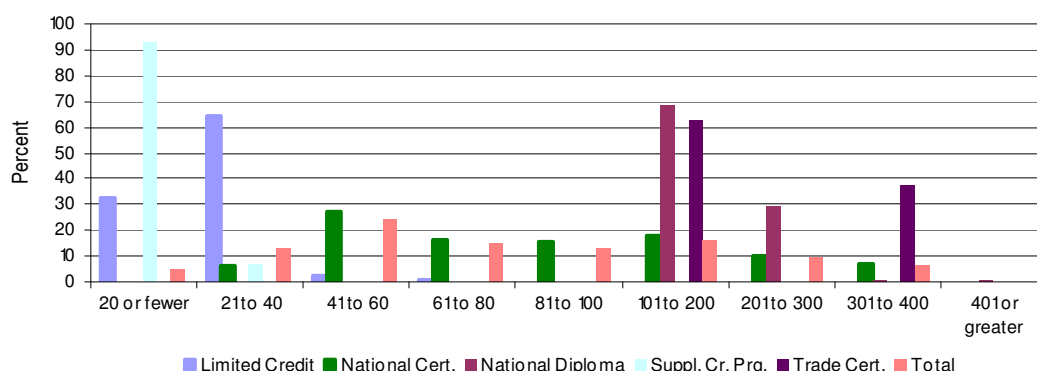
Source: Tertiary Education Commission

Figure 4 shows enrolments (for those active between 2001 and 2006) by programme type and credit load. Although weighted for participation, it illustrates the varying credit load of the different programme types. Limited Credit Programme learners were most likely to be studying in programmes bearing between 21 to 40 credits, while those enrolled in National Certificate programmes were much more widely spread between load categories: they were just as likely to be enrolled in programmes bearing 21 to 40 credits to 301 to 400 credits. As National Certificates accounted for the majority of programmes, the profile of distribution for industry training quite closely mirrors those.

National Diploma learners, although comparatively few, were more likely to be studying in programmes with a credit load of over 100 credits, as were those enrolled in Trade Certificate programmes.

Figure 5: Enrolments by credit load and ethnic group (2001-2006)
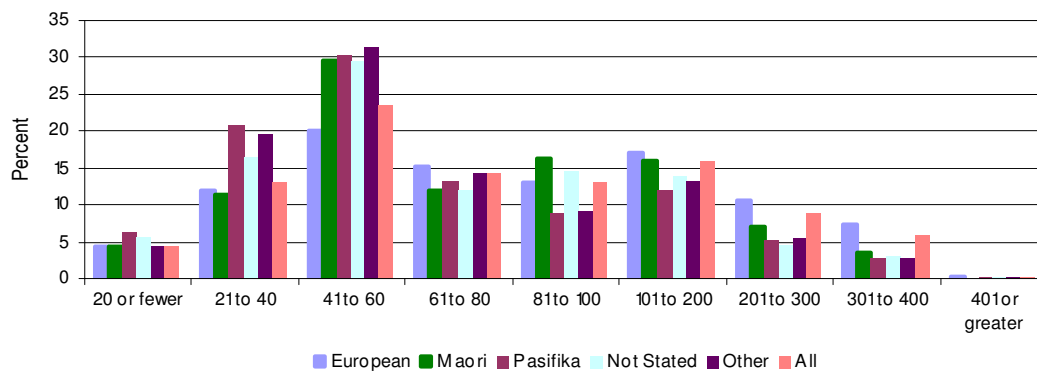
Source: Tertiary Education Commission

Figure 5 shows that there were differences between ethnic groups in enrolment of programmes by their credit loading. The most obvious trend is that Pasifika learners were more likely than European learners to be studying in a programme bearing a lower credit load, and less likely than them to be studying in a programme bearing a high credit load. Māori and European learners shared a similar credit load enrolment profile.

Figure 6: Enrolments by credit load and gender (2001-2006)

Source: Tertiary Education Commission

Figure 6 clearly shows that there was a difference in the credit load enrolment profile between male and female learners. Female learners were more likely than men to be enrolled in programmes bearing a lower credit load, while men were more likely than females to be enrolled in programmes bearing a higher credit load.

Figure 7: Enrolments by credit load and age at enrolment (2001-2006)
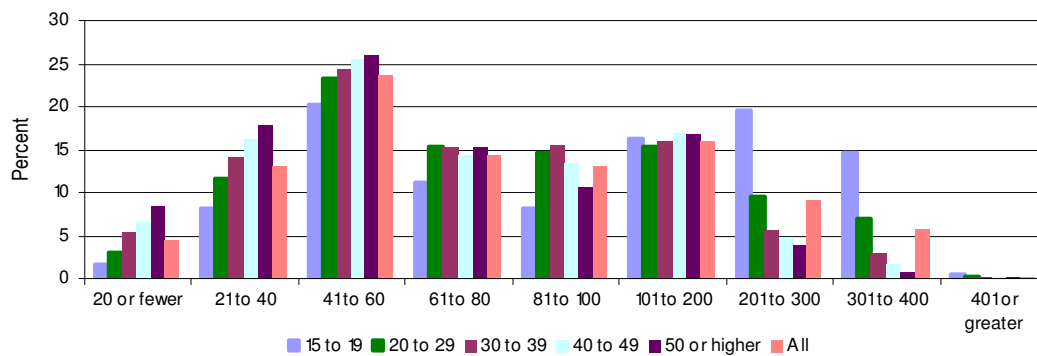
Source: Tertiary Education Commission

Figure 7 illustrates variance between programme enrolment by credit load and age at enrolment. Generally speaking, older learners are more likely than younger learners to be distributed in a lower credit bearing programme, but this pattern does not hold for programmes bearing 61 to 200 credits, where the distribution is much more even across ages.

2.5   Programme level

Each programme is assigned a National Qualifications Framework level. This describes the level of the programme overall, however, programmes may be made up of unit standards at varying levels on the framework. The programme level describes the level of the majority of the unit standards constituting the programme.

Figure 8: Enrolments by NQF level and ethnic group (2001-2006)
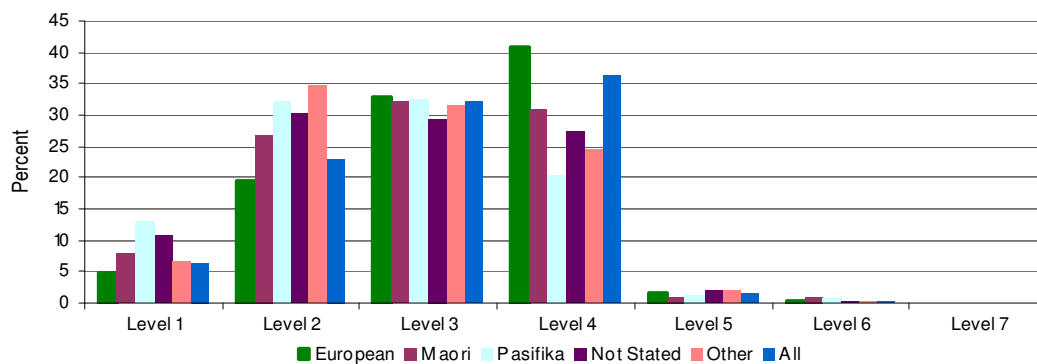
Source: Tertiary Education Commission

Figure 8 illustrates that there is variation between ethnic groups in enrolment at the different National Qualifications Framework levels. In particular, Pasifika learners (and to a lesser extent Māori learners) are more likely than European learners to enrol in programmes at lower levels (levels 1 and 2). Enrolment at level 3 is evenly spread proportionally between the groups, with approximately 30 percent of enrolments for each group being in programmes pitched at level 3. At the higher level, the difference between the ethnic groups is marked: European learners (at 41 percent of their enrolments) are much more likely than any other group (Māori at 31 percent; Pasifika at 20 percent) to be enrolled in programmes at level 4.

2.6   Level and credit load

A comparison of credit load by NQF level for programme enrolments shows differences in the credit load of programmes, corresponding with their NQF level. Recall that during the 2001 and 2006 period, there were a total of approximately 2,000 distinct programmes in operation. Figure 9 below shows the variation of credit load by NQF level of programmes.

Figure 9: Programmes by average credit load and NQF level (2001-2006)
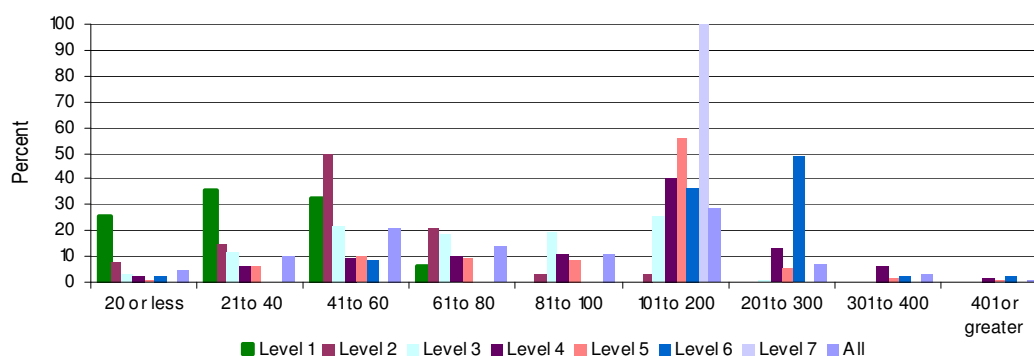
Source: Tertiary Education Commission

Level 1 programmes tended to bear 60 credits or less, while level 2 programmes were likely to have a higher credit load again. Programmes at level 3 were most likely to consist of 81 to 200 credits, while level 4 programmes are fairly evenly spread between programmes with 21 to 100 credits, with 40 percent of level 4 programmes bearing between 101 to 200 credits. Level 5 programmes are also most likely to bear between 101 to 200 credits, while all level 7 programmes are within this range (due to the relatively small number of level 7 programmes, the majority of them are clustered within one category). Level 6 programmes are most likely to bear between 101 to 300 credits.

Figure 10: Enrolments by credit load and NQF level (2001-2006)
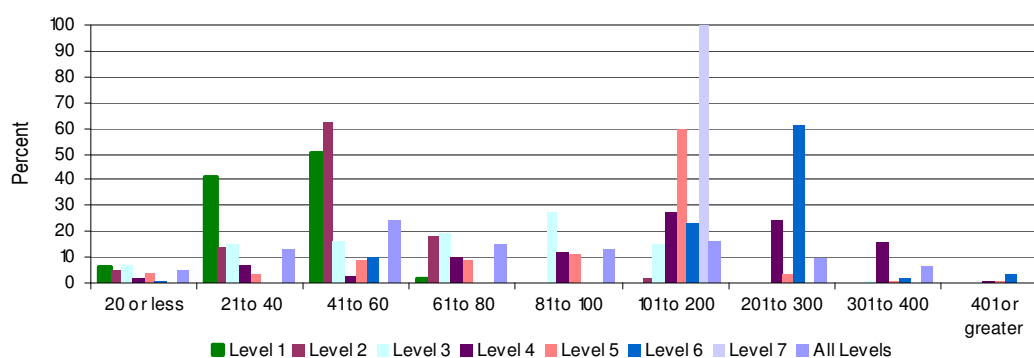
Source: Tertiary Education Commission

Weighted for enrolment (meaning this distribution reflects the number of learners enrolled in programmes, rather than the number of distinct programmes that are available), these credit load by level patterns change little, in general following the pattern that the higher the NQF level of programme of study, the higher the overall credit load.

2.7   Standard Training Measures (STMs)

For funding purposes industry training learning volume is measured using STMs. This measure is used by TEC to ascertain if a standard volume of training, that is, 120 credits in an approved structured training programme, a year, is achieved, against a contracted level. It can be thought of like the Equivalent Full-Time Students (EFTS) measure of the volume of student component learning: it is a way to compartmentalise learning against a notional standard volume of learning. In this case, STMs have nothing to do with whether the learner engages in full-time learning, since industry training learners' main activity is generally their employment; industry training is a secondary activity.

As a learner's volume of training is measured against a standard of 120 credits per programme, the outcome of contracted STMs is a proportion that denotes the closeness of the volume of learning to this level. The higher the proportion measure (the closer it is to 1), the closer the learner's proposed volume of learning is to the 120 credit per year standard. It is possible to be categorised higher than 1, indicating that the proposed level of study is greater than the 120 credit level.

Figure 11: Enrolments by proposed STMs and ethnic group (2001-2006)

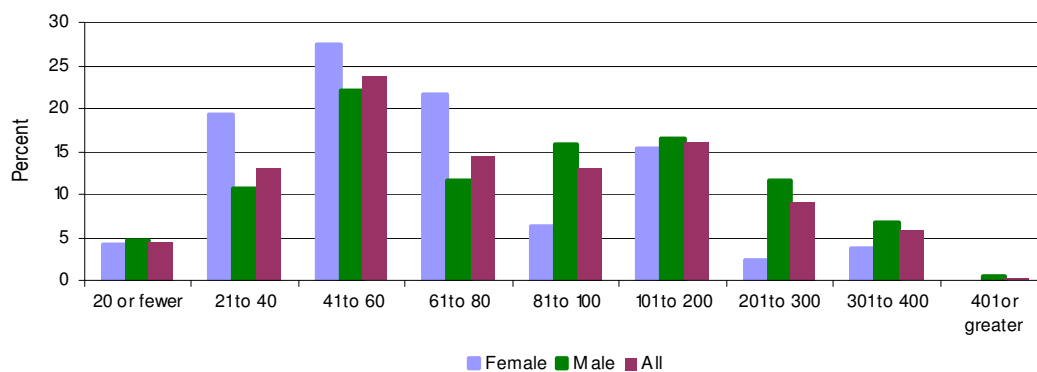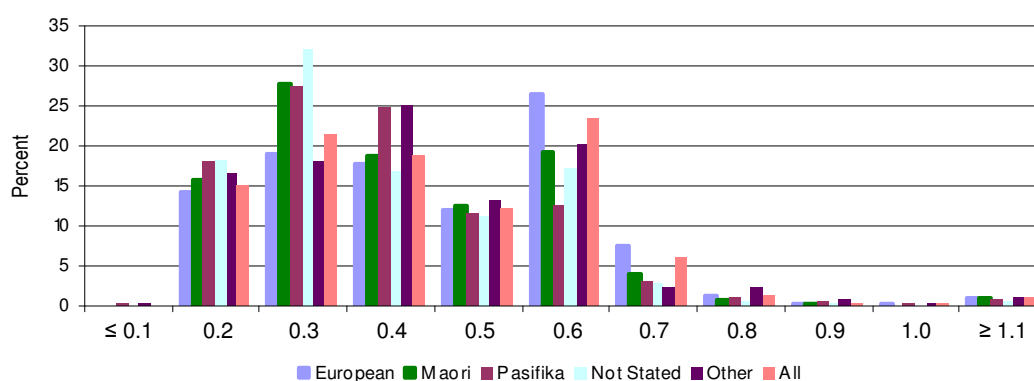Source: Tertiary Education Commission

Figure 11 shows that the majority of learners in industry training (55 percent) study at a rate of 0.4 or below of an STM. There are differences in STM load between ethnic groups, most obviously that Māori and Pasifika learners are less likely than European learners to be studying in programmes at higher STM loads (0.6 or greater). They are correspondingly more likely than European learners to be studying in programmes with lower STM loads: at STM levels 0.2 and 0.3, there is particularly noticeable difference between Pasifika learners and European learners.

Also of interest is the proportion of learners at high STM levels. It is possible that some of these learners are involved in *Recognition of Prior Learning* rather than instruction and assessment, due to the high volume of learning as it is difficult to believe that these learners would have the time to concentrate to this volume of study in each year, given that their main activity is their occupation. Information on the mix between recognition of prior learning, and learning and assessment activity is not collected, therefore it is (at this stage) impossible to differentiate between them.

2.8   Expected duration of programmes

Industry training learners are able to study at their own pace, within certain workplace-set limitations (including availability of trainers and arrangements for when assessment must occur, etcetera). However, each programme has an assigned expected duration value attached to it, representing the expected duration of training on the programme, in months, for the average learner. This value is assigned to each programme by TEC, and is the basis for calculating STMs.

As previously mentioned, learners can enrol in more than one programme in industry training; their 'time' is defined as the sum total of their learning, until they either exit industry training or complete the requirements set out in their training agreement or plan. The following analysis is per single programme however, so, for the minority who enrol in more than one programme while in industry training, the programme duration will not adequately express total time in learning.

Figure 12: Enrolments by expected programme duration (months) and ethnic group (2001-2006)
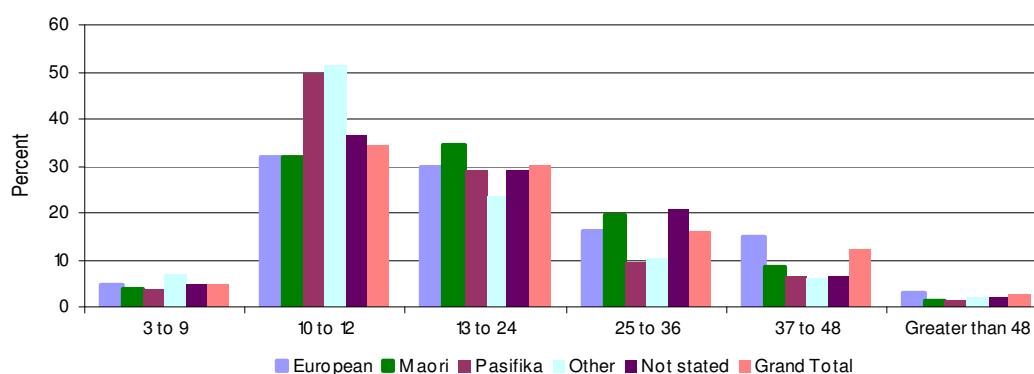
Source: Tertiary Education Commission

Figure 12 shows that there is a difference between ethnic groups in terms of enrolment in programmes by their expected duration; Pasifika and 'Other' groups are less likely than Māori and European learners to be enrolled in longer-term programmes, and are most likely to enrol in programmes expected to last up to 12 months in total.

Figure 13: Programme enrolments by expected duration (months) and age at enrolment (2001-2006)
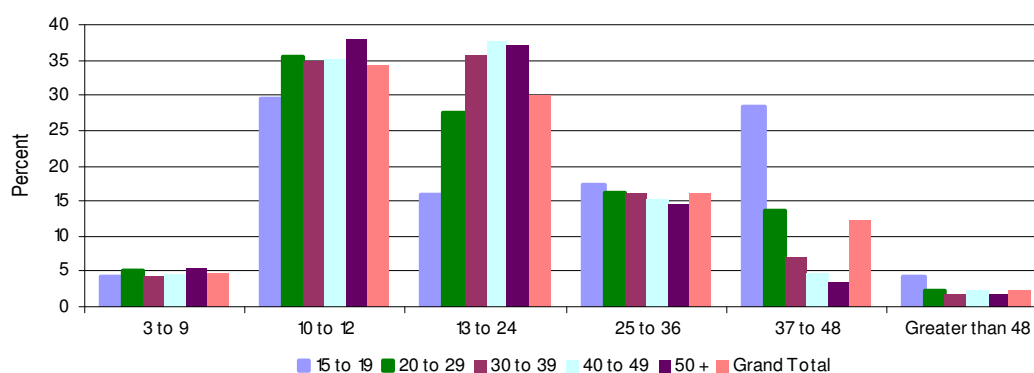
Source: Tertiary Education Commission

Figure 13 shows that the majority of learners engage in programmes that are expected to last between 10 and 24 months. There is a difference in participation between different age groups: younger learners (aged 15 to 19 years) are more likely than older learners to enrol in programmes that are expected to run from between 37 and 48 months. Younger learners are also less likely than older learners to participate in programmes expected to take 13 to 24 months. Older learners (aged 50 years or over) are much less likely to participate in longer-term programmes than other groups.

Figure 14: Programme enrolments by expected duration (months) and gender (2001-2006)
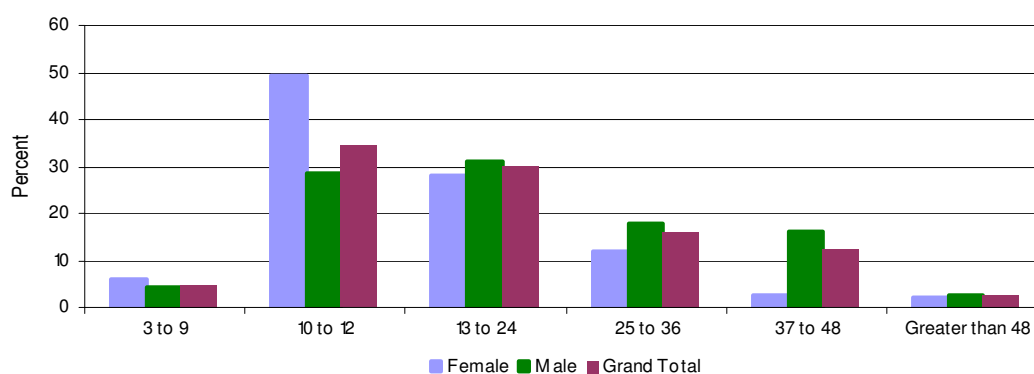
Source: Tertiary Education Commission

Females and males differ in enrolment in programmes in terms of their expected duration. More than half of female enrolments are in programmes expected to last 12 months or less, while males are more likely to enrol in programmes that are expected to last for 12 months or more.

2.9   Industry training organisations

Industry training organisation (ITOs) are responsible for managing arrangements for training, setting standards and qualifications, and providing industry skills leadership. While ITOs do tend to represent training for a particular industry, some of them make arrangements for many diverse industries. Subsequently, use of enrolment by ITO as a proxy measure for training industry is not entirely accurate, but fills a current information void.

During the 2001 to 2006 period, there were 43 ITOs in operation in total: by December, 2006, there were 38 ITOs with programme enrolments. Some of these ITOs are no longer operating solely: there have been some amalgamations.

Figure 15: Enrolments by industry training organisation and ethnic group (2001-2006)
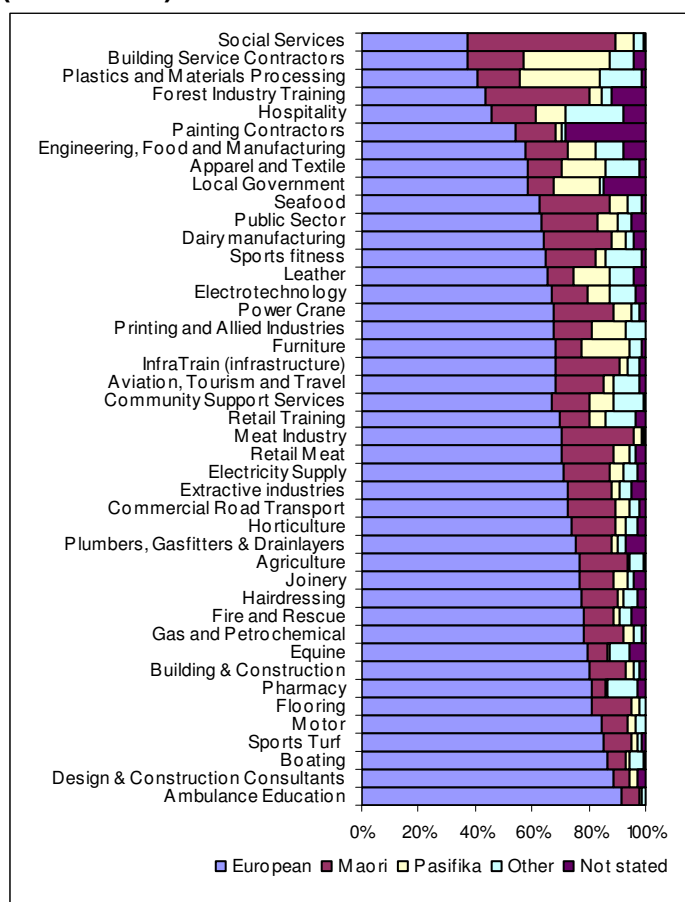
Source: Tertiary Education Commission

Figure 15 shows that there are differences between ethnic groups in enrolment by industry training organisation (and therefore perhaps by industry). European learners account for over half of all enrolments in each industry, bar five: Social Services; Building Services Contractors; Plastics and Materials Processing; Forestry; and Hospitality.

Enrolments by Māori learners are proportionally highest in the following industries:

- Social Services (51.7 percent)
- Forestry (36.8 percent)
- Meat (25.6 percent)
- Seafood (24.9 percent)
- New Zealand Industry Training Incorporated (covering dairy manufacturing, dairy transport, leather manufacturing, meat processing and other industries – 23.4 percent).

Enrolments by Pasifika learners are proportionally highest in the following industries:

- Building service contractors (30.1 percent)
- Plastics and materials processing (28.6 percent)
- Furniture (16.6 percent)
- Local government (16 percent)
- Apparel and textile (15.4 percent)

'Other' learners account for 20 percent of enrolments with the Hospitality ITO, the largest proportion, followed by plastics and materials processing (14.7 percent).

Figure 16: Enrolments by industry training organisation by gender (2001-2006)
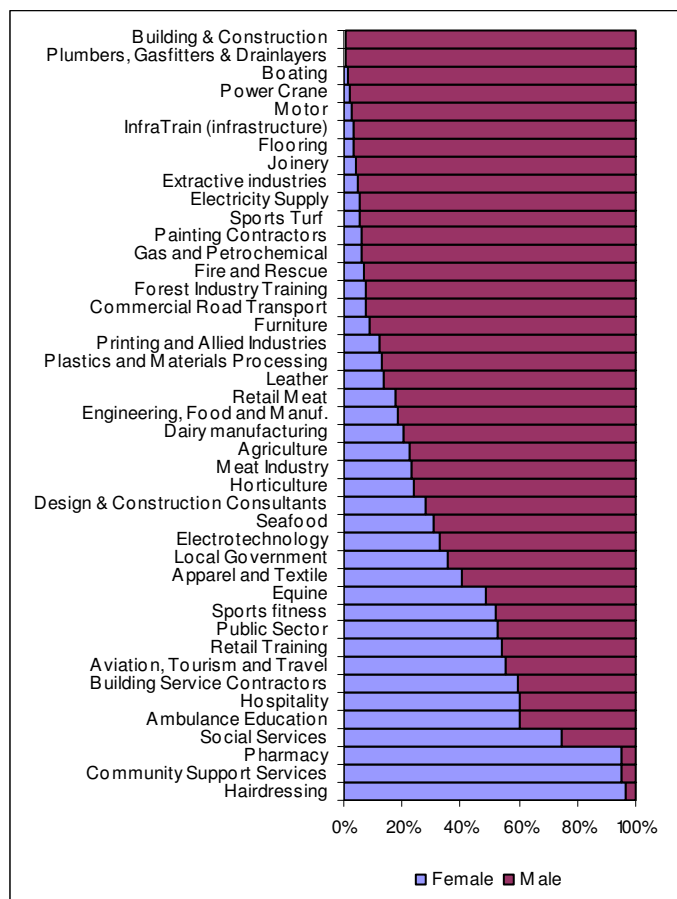
Source: Tertiary Education Commission

Figure 16 illustrates the differences in enrolment between males and females and ITOs. While ITO 'name' does not provide a strict match for industry of learning, it is clear that females are much more likely than males to be working and learning in certain industry areas, and vice versa.

Females were more likely than males to be enrolled in programmes covering the following industries: hairdressing; community support services; pharmacy; social services; ambulance education; hospitality; building services contracting; aviation, tourism and travel; retail; public sector; and sports fitness. Males outnumbered females in all other industries, some to a larger (building and construction) or lesser (equine) extent.

Figure 17: Enrolments by industry training organisation by age group (2001-2006)
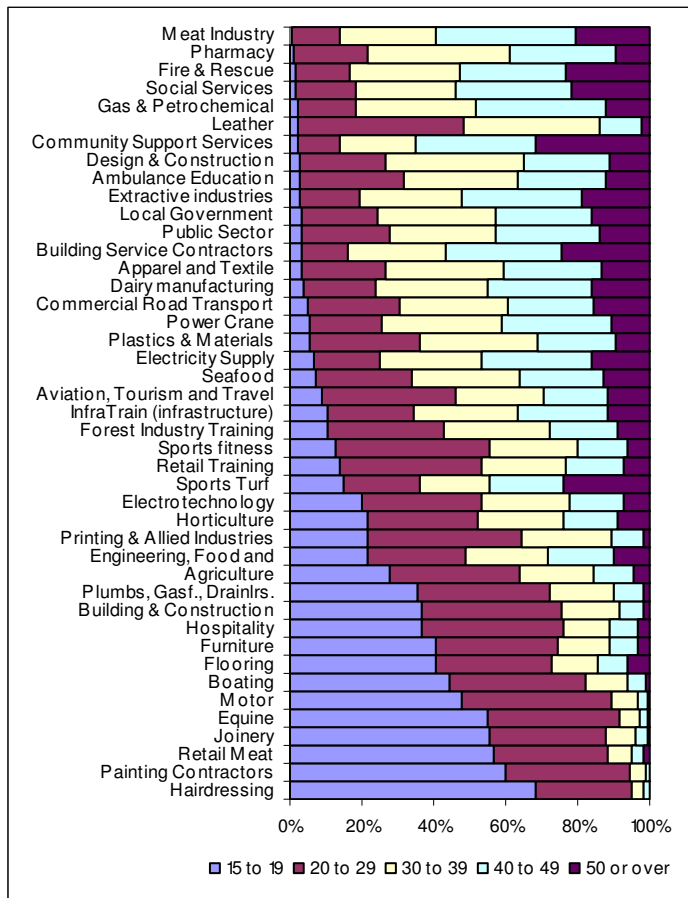
Source: Tertiary Education Commission

Figure 17 illustrates the difference in enrolment by industry for the different age groups. Fifteen to 19 year olds make up over half of learners in the hairdressing; painting contractors; retail meat; joinery and equine industries. They are barely represented in the meat; pharmacy; fire and rescue; social services and other industries.

Twenty to 29 year olds account for 30 percent of learners; the largest group overall. They are widely spread throughout industries, but are also less likely to be represented in the meat; pharmacy; fire and rescue and social services industries. The 30 to 39 and the 40 to 49 age group profile spread shows that these older workers are more likely to be enrolled in learning in industries that do not seem to attract the younger ones. Older learners (50 years or over), the most evenly spread across industries, are more highly represented in the sports turf and the community support services industries.

3. The Outcomes of industry training

This section provides information about all learners who exited a programme between 2001 and 2006.[6] As with the first section, it describes the activity of learners who exit from programmes, rather than making generalisations about the learners themselves. As previously described, this is because in the dataset the basic unit of analysis is programme activity, rather than individual activity.

The preceding section described the enrolment activity of all learners who were active between 2001 and 2006. Therefore, there will be some individuals who are in both analyses. The groups examined in this section and in the previous section are therefore slightly different cohorts. Both groups may have enrolled prior to 2001, or during the 2001 to 2006 period, and both were active between 2001 and 2006. The outcome group consists of all programme exits between 2001 and 2006. The main point of difference is that while the input group may (or may not) have exited a programme during this time, the outcome group were selected on the basis of an exit in the period.

As with the input group, learners may be enrolled in more than one programme, and may therefore "exit" from a programme more than once during the period of interest. By treating each exit as the unit of interest, it is possible to examine several associated programme outcome variables.

These include:

- the total number of credits achieved in programmes
- national qualification achievement
- duration of programme activity
- programme completion.

Accumulation of any of these alone may be a valid measure of success in industry training. Credit accumulation by learners signifies recognition of increasing skill attainment, and possibly an associated improvement in productivity and capacity to do their job (if the standards taken are relevant to their employment, or contribute to employee improvement in generic competencies). In the absence of a programme of national qualification completion, credit attainment provides an important measure of the skills acquired in training to prospective employers in the labour market.

National qualification attainment is a clear labour market signal that a benchmark of learning and proficiency has been attained. This credentialing signals human capital accumulation and in the case of some industries, is a prerequisite for progression within it where professional recognition is required.

Programme completion may act as signal that the learning intentions of both parties: learner and employer, have been met, but may not provide much information on the skills accumulated to external parties or wider recognition of them within the labour market.

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[6] Where appropriate, for example for duration analyses, subsequent data extracts have been examined to determine if findings are borne out by use of wider cohort windows provided with additional years of data.

3.1   Total numbers of learners leaving programmes and programme exits

During the 2001 to 2006 period, there were a total number of 359,299 programme exits, involving 232,002 distinct learners. Some of these exits are from multiple enrolments in the same programmes. Where this occurs, the credits and national certificates attained on each programme have been summed in total, and only one exit (the final one) has been counted. This brings the total number of exits down to 345,260. This means there were 14,039 first exits from programmes where there was subsequent re-enrolment and a subsequent exit.

Table 3: Programme exits and enrolments 2001 - 2006

Year	Total number of exits	Number of exits with single enrolment	Total number of enrolments
2001	35,904	33,201	28,599
2002	39,389	36,941	42,314
2003	60,857	56,947	42,296
2004	63,881	61,117	49,555
2005	68,971	66,757	60,898
2006	90,297	90,297	62,738

3.2   Credit achievement

As previously described, industry training learning consists of units on the National Qualifications Framework. Programmes consist of units of learning known as Unit Standards, each of which is pitched at a level on the framework, and has an associated credit value, which is awarded to learners if they achieve each standard.

Programmes can be made up of a variety of unit standards, pre-existing on the framework, or developed especially for the purpose by the ITO. While a programme may be set at a certain level on the framework, it can consist of credits from units at a variety of levels.

A good measure of achievement in industry training may be the average credit achievement per learner per programme. This can be measured in a number of ways. One way is by dividing the total sum of credits by the total number of exits. This will give an average number of credits achieved for all programme exits. [7]

Overall, for all learners who left a programme between 2001 and 2006, average credit achievement was 35.41 credits.

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[7] Possible alternative methods are discussed further in the appendix.

Table 4: Programme exits 2001 – 2006

Programme exits:	345,260
Programme exits with credits:	212,326
Total distinct learners:	232,002
Total credits achieved by all exits:	12,225,337
Average credit achievement all exits:	35.41

Figure 18: Average number of credits achieved for all programme exits by ethnic group and year of exit
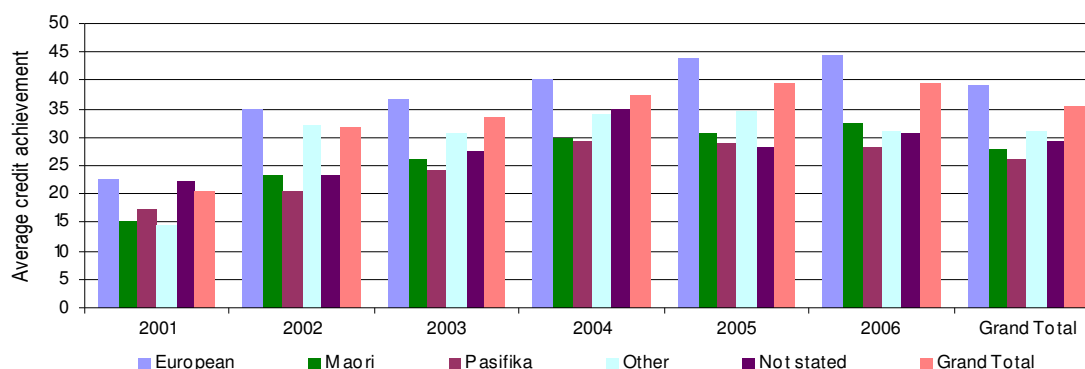
Source: Tertiary Education Commission

Figure 18 shows the average credit achievement for all programme exits occurring between 2001 and 2006. The total sum of credits attained by each ethnic group in a year is divided by the total number of exits occurring by year and ethnic group. This shows consistent trends of: increasing average credit achievement per exit per year; and European learners gaining more credits on average than Māori or Pasifika learners per programme exit.

However, this dataset was created in 2000, and it may have taken administrators some time to come to arrangements to record learner credit attainment efficiently. It is not known whether the lower credit attainment evidenced in the earlier years of the data collection (2001 to 2003) reflects the true level of attainment, or is a reflection of some form of administrative 'bedding in'.

The TEC collects credit achievement by credit level, and the previous approach can be used to determine average achievement by level for all programme exits. Figure 19 shows the difference in average credit achievement by level for each ethnic group, at the aggregate average achievement rate and disaggregated by NQF level.

Figure 19: Average number of credits achieved for all programme exits by NQF level disaggregation and ethnic group (2001-2006)
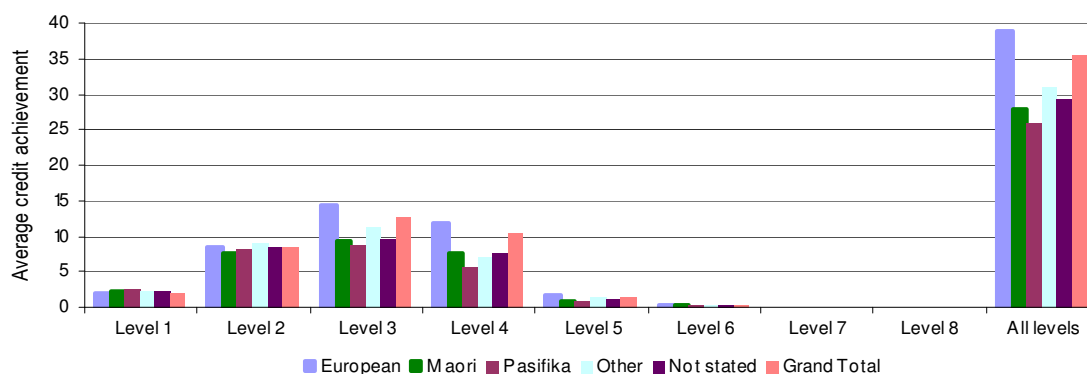
Source: Tertiary Education Commission

This is the average credit achievement per programme exit, simply divided by the proportion attained at each level. There are some differences between average credit achievement per learner per programme exit by ethnic group. For all learners leaving a programme, European learners achieve an average of 39 credits per programme, while Māori and Pasifika learners achieve an average of 28 and 26 credits respectively. European learners are more likely to attain more credits than other groups, at higher NQF levels.

Unfortunately, using current data collection techniques, it is not known if all credits attained by learners in industry training are in fact submitted to NZQA and/or the TEC. Where data indicates nil credit achievement for learners, it is not currently possible to tell whether this means that this is due to non-submission of credit information by the provider, or is because of a lack of credit achievement by learners. It may be that learners who shift jobs in the midst of their learning do not have their credits recorded.

To negate the effect of non-reporting of credits, we calculate the average credit achievement for programme exits in which there was some credit attainment.

3.3   Average credits per learner

It is possible to determine an approximate average credit achievement at the learner level (all credit achievement measures have thus far been at the programme level). For these same learners, the total number of credits achieved has been summed, and divided by the total number of distinct learners in each category. This provides an approximate measure for the total number of credits achieved on average in industry training. It has not been possible to perform this analysis by year, as including year would inflate the count of distinct trainees, (and therefore the denominator).

Figure 20: Average credit achievement per learner in the period, for learners in the exit cohort by ethnic group and gender
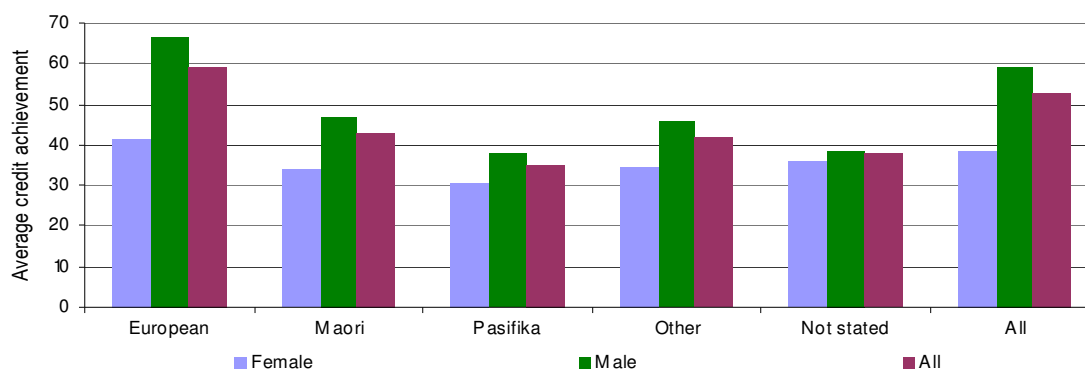
Source: Tertiary Education Commission

Figure 20 shows that overall, learners in the cohort attained an average of 52.7 credits in industry training during the period. The highest attaining group was European males (66.4), followed by Māori males (46.7). The differences between males and females were more pronounced for some ethnic groups (i.e. European) than others (i.e. Pasifika). The female 'Not stated' group was the only one who came close to attaining as many credits on average as their male counterparts.

Figure 21: Average credit achievement per learner for learners in the exit cohort who attain credits by ethnic group and gender
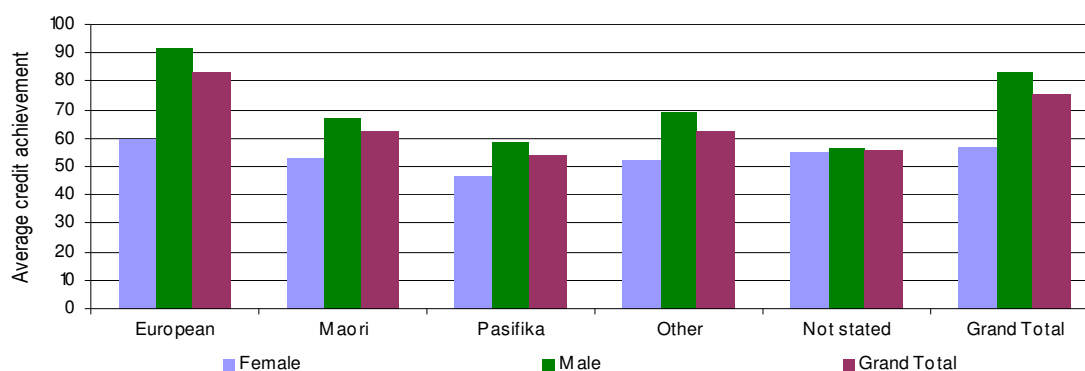
Source: Tertiary Education Commission

Eliminating all those who achieved zero credits increases the average credit achievement level for all groups. For distinct learners in the cohort, whose credit achievement was not zero, the average credit achievement from industry training during the period was 75 credits. Figure 21 shows that average credit attainment for Māori was 63, for European learners; 83 and for Pasifika learners; 54.

3.4 National qualification attainment

Industry training learning generally progresses towards national qualifications on the National Qualifications Framework, as stipulated in section 13.a of the Industry Training Act, 1992 requiring TEC:

"…*To promote the wide availability within industry of high quality industry training linked to nationally recognised qualification*s…"

These qualifications are tied to industry need, and are developed by ITOs, who are themselves industry representatives. Some programmes do not lead directly to national qualifications, but constitute small 'packages' of learning, suited to industry and learner need.

Learners in industry training sign up to a training agreement (or plan in the case of Modern Apprenticeships) which sets out their programme specifications. This can involve studying on a number of programmes, and each programme can potentially lead to a National Qualification, such as a National Certificate or National Diploma. Learners work towards a certification award in each programme, often an award or several are attained through completing the requirements of the programme (this is not to say that qualification attainment relies on programme completion, however).[8]

Most programmes in industry training lead directly to national certificate (87 percent) awards.[9] The remainder are supposed to do so by a round-about route (such as Limited Credit Programmes) or are a supplement for those who already have attained a national certificate (Supplementary Credit Programmes). The remainder lead to other qualifications, such as a trade certificate.

Shorter programmes called Limited Credit Programmes (LCPs), can feed into national certificates, in combination with other programmes. However, there is anecdotal evidence that, in many cases, they are used as stand-alone programmes of learning, that do not lead to further study in industry training. Limited credit programmes may not of themselves lead to national certificates, but it is also possible to test what proportion of learners who have done a limited credit programme also attain a national certificate and the total duration of programmes taken by learners who enrol in at least one limited credit programme.

National qualifications are developed for the purpose of certifying learning in industry areas, by an ITO. Like the units that make up programmes, programmes may be set at a certain level on the framework. The level of the qualification is set by the level of the majority of the mix of units that make it up. Once a learner has attained certification, the certification is described by its level on the framework (for example: *National Certificate in Hairdressing, Level 2*).

TEC collects information from ITOs on the number of national certificates awarded at each level, for each learner on a programme. It does not currently record the attainment of national diplomas or trade certificates (trade certificates are in the process of being phased out). The number of national qualifications achieved per programme, or per learner, is potentially a good measure of the levels of achievement in industry training. TEC specifies that ITOs should not report that a programme has been completed, unless at least one national certificate has been attained by the learner in the process.

This section analyses national certificate achievement using a new cohort of learners, which we have named the *national certificate cohort*. It has been necessary to use a different cohort than for credit achievement because, at the time of analysis, national certificate achievement data was only available from 2003 to 2006.

For analysis at the programme exit level, the outcome cohort can be used, but must be further limited to exits occurring between 2003 and 2005. A 'whole of industry training experience' regarding national certificates can perhaps be ascertained by limiting the cohort in this way. By excluding learners who trained in 2006, and only including those whose last year of training was

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8 Once a certain level of credit attainment has been achieved, it is also possible for learners to gain additional qualifications by attaining additional credits to the credit value of their original training programme qualification.
9 For more information on programme types, see Profile and Trends 2006, chapter 6 article

2005 (or earlier) it is possible to assume that participation in industry training has finished (or they took an extended break in 2006) before the final year that data is available for (2006).

When examining average achievement at the learner level, the outcome cohort cannot be used because of a potential bias: the outcome cohort is, by definition, all those who exited a programme between 2001 and 2006 (or in this case, 2003 to 2006). Since it has been established that 37 percent of learners do more than one programme during industry training (as measured for the input cohort), it is possible that those who exit towards the end of the period (2005 and 2006) would otherwise have needed to complete more programmes in order to attain their national certificate, and this study would occur subsequent to 2005 or 2006. There is also the fact that the outcome cohort, while they may exit a programme between 2001 and 2006, may have attained, but not have had recorded, national certificates prior to 2003 (when TEC's national certificate data collection commenced).

For these reasons, the national certificate cohort has been limited to those who commenced a programme in 2003 (or later), and who exited a programme by 2005, and who did not study in industry training subsequent to 2005, according to the dataset. While this is not entirely satisfactory, as the potential time period of 3 years may not be long enough to encompass all learning in industry training, it is the only way to eliminate the time biases, until more full-year datasets become available.

The national certificate cohort contains 50,449 programme exits, by 42,237 distinct learners. The gender and ethnic breakdown of the cohort is shown in Figure 22 below. European learners account for 63 percent of exits; Māori 16 percent; Pasifika 5 percent; 'Other' account for 10 percent, and 'Not stated' account for 6 percent of exits in the period. Males accounted for 61 percent; females: 39 percent. These proportions are similar to those of the enrolment cohort.

Figure 22: Programme exits in the national certificate cohort by ethnic group and gender (2003-2005)
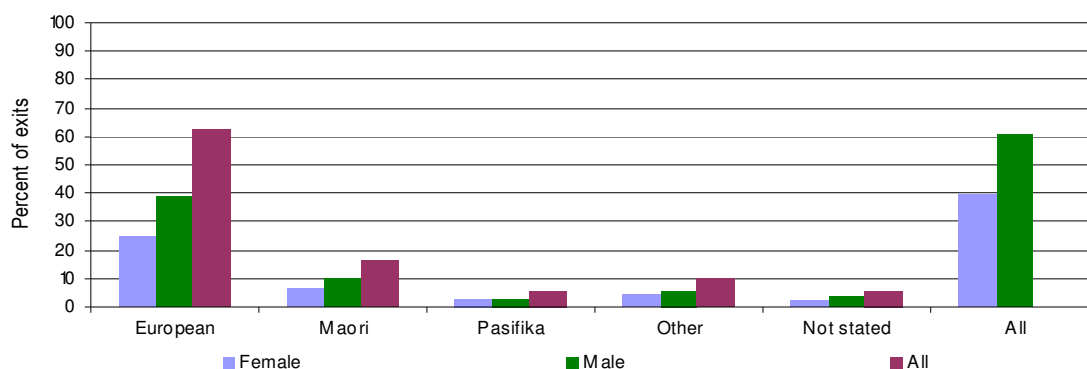
Source: Tertiary Education Commission

As for credit achievement, there are a number of ways to measure national certificate achievement: one way is by dividing the total sum of national certificates attained by the total number of programme exits. This provides an average number of national certificates achieved for all programme exits.

Figure 23: Proportion of exits with national certificate attainment by ethnic group and gender (2003-2006)
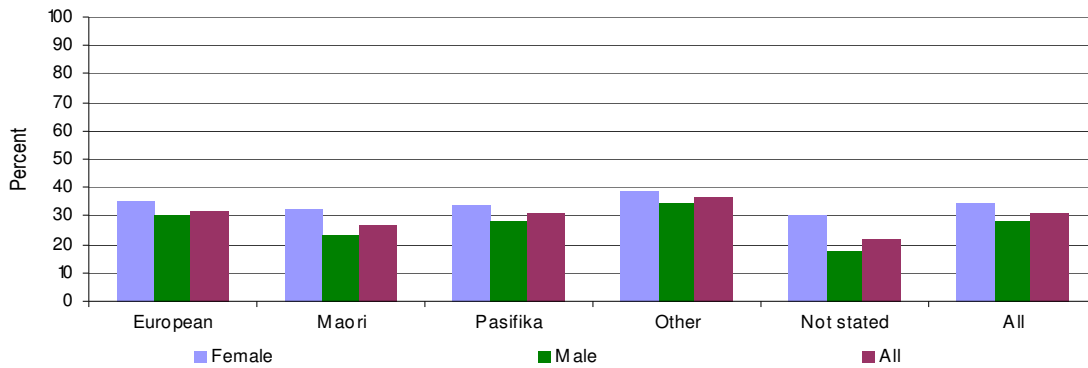
Source: Tertiary Education Commission

The national certificate cohort attained a total number of 15,599 national certificates between 2003 and 2006. During 2003 to 2006, there were 50,499 exits, averaging to around one national certificate attained for every three programme exits (a rate of attainment of 0.31 national certificates per exit).

Figure 23 shows that the probability of attaining a national certificate at each exit varies between gender and ethnic groups. European and 'Other' learners are more likely than Māori or Pasifika learners to attain a national certificate at each exit. Females are more likely than males to attain a national certificate at each exit; the difference between males and females is the most marked for the Māori and 'Not stated' ethnic groups.

Another way that national certificate achievement can be measured is by dividing the total sum of national certificates attained by the total number of learners in the cohort, providing an average number of national certificates achieved for learners in the cohort.

Figure 24: Proportion of learners in cohort with national certificate attainment by ethnic group and gender (2003-2005)
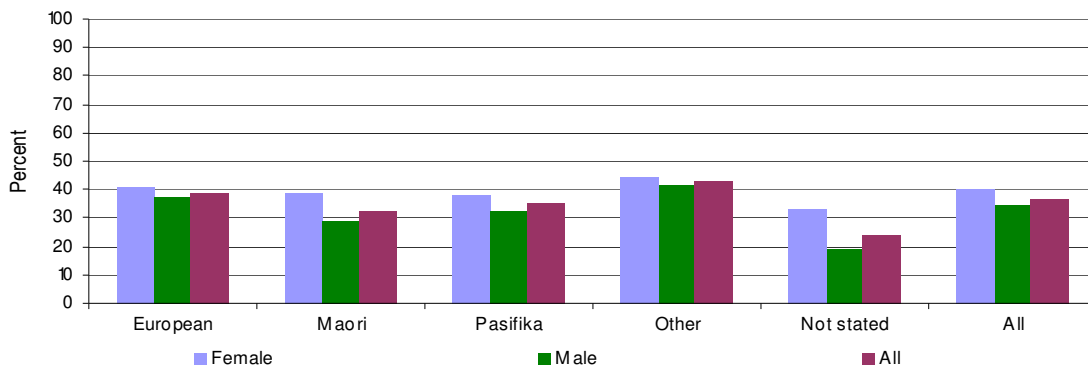
Source: Tertiary Education Commission

Figure 24 shows that for each distinct learner in the cohort, 0.37 national certificates were achieved. The probability of achieving a national certificate was the highest for European females, at 0.41 (41 percent of distinct female European learners attained a certificate), for all Māori it was 0.33, and for all Pasifika, it was 0.35.

For all those who attained a certificate, it is interesting to examine the differences in the NQF level of certificates attained by ethnic group.

Figure 25: Proportion of national certificates attained in cohort by level and ethnic group (2003-2005)
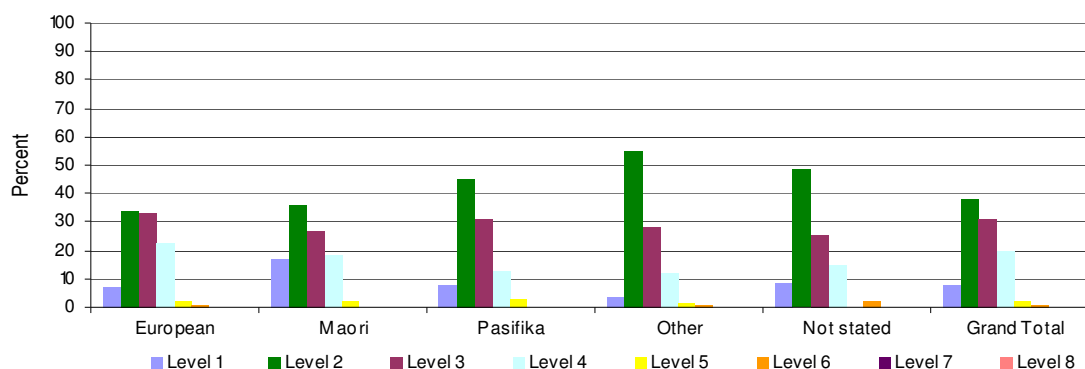
Source: Tertiary Education Commission

Figure 25 shows the distribution of certificates attained by NQF level, and ethnic group. These proportions are derived by dividing the number of national certificates attained for each level and group, by the total number of certificates attained for that group.

On average, there are differences between ethnic groups in the levels of the certificates achieved. For the European group, level 2 and 3 certificates are both a little over 30 percent of the total certificates attained by this group, with level 4 accounting for approximately 20 percent of certificates attained. For Māori, Pasifika, 'Other' and 'Not stated' groups, certificates are more concentrated at level 2, with lower proportions of attainment on average at the higher levels.

There is also a difference between ethnic groups in terms of average national certificate attainment by programme type.

Figure 26: National certificates achieved by programme type and ethnic group (2003-2005)
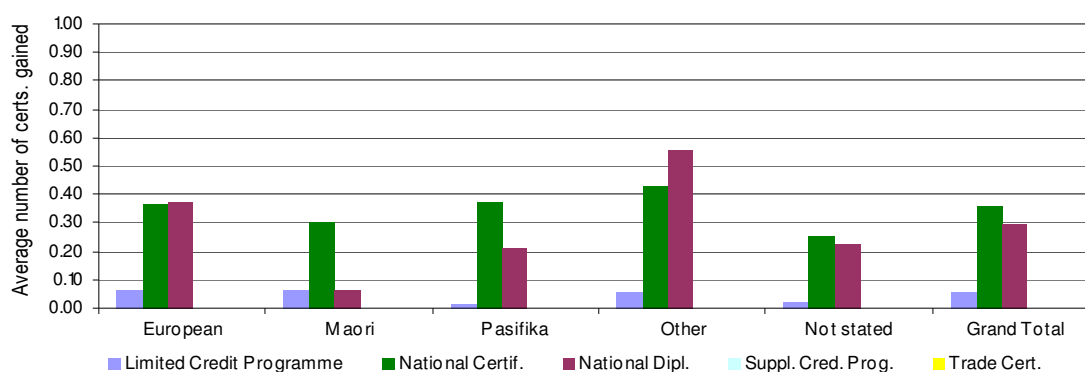
Source: Tertiary Education Commission

Figure 26 shows that the average number of national certificates attained for learners exiting limited credit programmes, supplementary credit programmes and trade certificates is much lower than for learners exiting national certificate and national diploma programmes. This is to be expected for supplementary credit programmes and trade certificates programmes, since the former are designed to be an adjunct for those learners who have already attained certification, and the latter are a separate vestige programme, not based on national certificate attainment.

For limited credit programmes, this reflects that, as a stand-alone programme of study, they do not in themselves eventuate in certification, but require further study to lead on to national certification. They are supposed to eventually lead to national certification, however, and are not meant as

stand-alone qualifications. This raises an important question: do learners studying in limited credit programmes go on to achieve national certificates?

Further interrogation of the data casts some doubt on this, and supports anecdotal evidence that, contrary to their purpose, limited credit programmes are used as stand-alone programmes.

Figure 27: Number of programmes pursued by learners by programme type and ethnic group
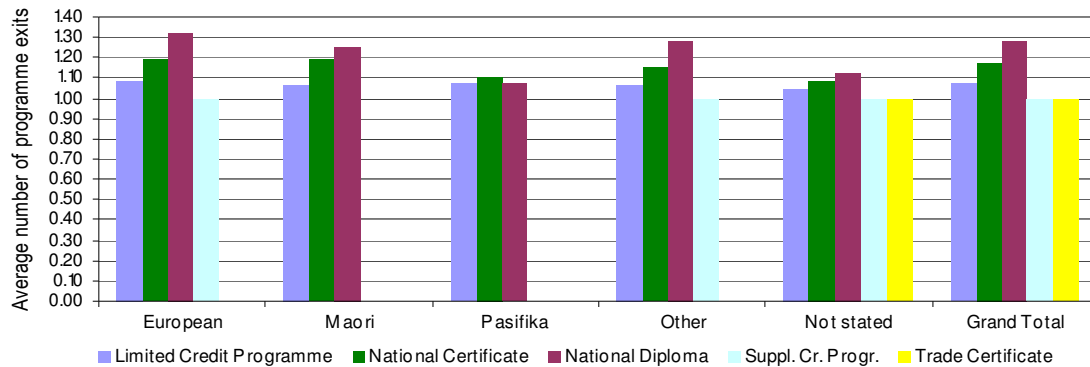
Figure 27 illustrates that for the national certificate cohort, those studying in limited credit programmes on average studied in nearly one limited credit programme (1.07 on average). This figure is attained by dividing the number of distinct programmes for each learner in each group, by the number of distinct learners in each group. This of itself does not signify that LCPs are used as stand-alone programmes, since learners may go on to do other types of programmes, such as national certificate programmes. Figure 31 below, shows, however, that most learners who exit with at least one LCP, do not go on to enrol in a national certificate programme.

Figure 28: Proportion of limited credit programmes exits with corresponding national certificate programme exits (2003-2005)
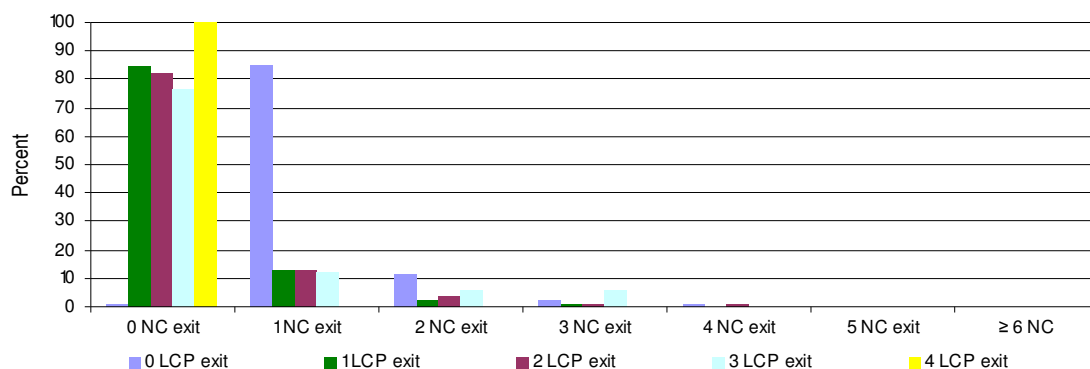
A total of 7,325 learners had one or more exits from a limited credit programme (out of 42,237 learners). Figure 28 shows that the majority of learners (6,182) who exited from limited credit programmes in the cohort did not participate in any national certificate type-programmes (84 percent of total 7,325 learners with LCP exits).

Figure 29: Distinct learners in cohort by limited credit programme exit status and number of national certificates attained
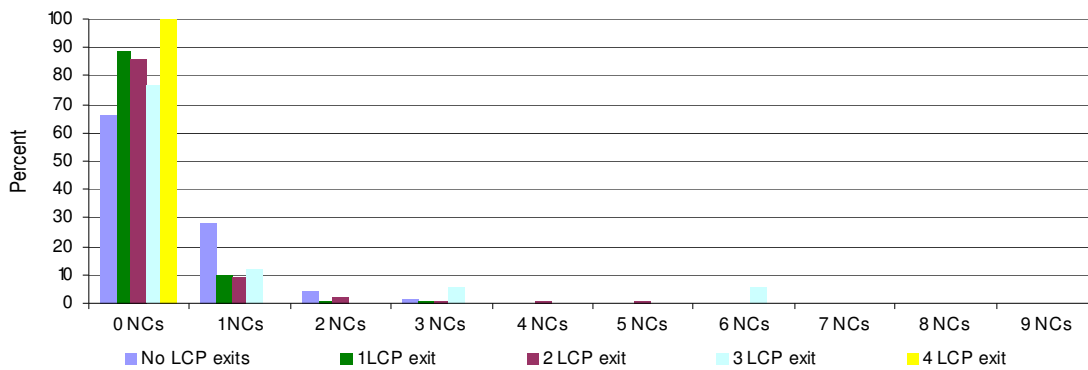
Source: Tertiary Education Commission

Figure 29 above shows the number of national certificates attained at the learner level, by the total number of exits from limited credit programmes for each learner (for each learner who ever exited a LCP, their total number of national certificates attained are counted). There were 7,325 (17 percent) distinct learners in the cohort who exited from one or more limited credit programmes (34,912 did not participate in a limited credit programme).

The vast majority of learners who had exited a limited credit programme, at any point during their time in industry training, did not go on to attain a national certificate (6,484 out of 7,325, or 89 percent). Or to put it reciprocally only 11 percent of learners (841 out of 7,325) who were involved in limited credit programmes at some point in their industry training learning within the bounds of the cohort window attained a national certificate.

For learners who were not involved in a limited credit programme (34,912 out of 42,237 or 83 percent) 11,711 (34 percent) attained at least one national certificate. Reciprocally, 66 percent (23,201 out of 34,912) of these did not attain a national certificate. Therefore, it is observed, learners are more likely to attain a national certificate if they do not participate in limited credit programmes at all.

While this data seems to be compelling, the window of data may or may not be of sufficient length to capture trainees' full 'industry training' experience. The window may not be long enough to answer whether learners are studying in limited credit programmes as stand alone programmes, or if they really do move on to national certificates, as intended.

It may be that learners who take up limited credit programmes require more time on average than this window to attain national certificates than those who study in national certificate programmes. Otherwise, the evidence is that the majority of limited credit programmes do not lead to learners to eventual certification.

Figure 30: Total duration (months) for cohort by LCP exit and NC attainment condition
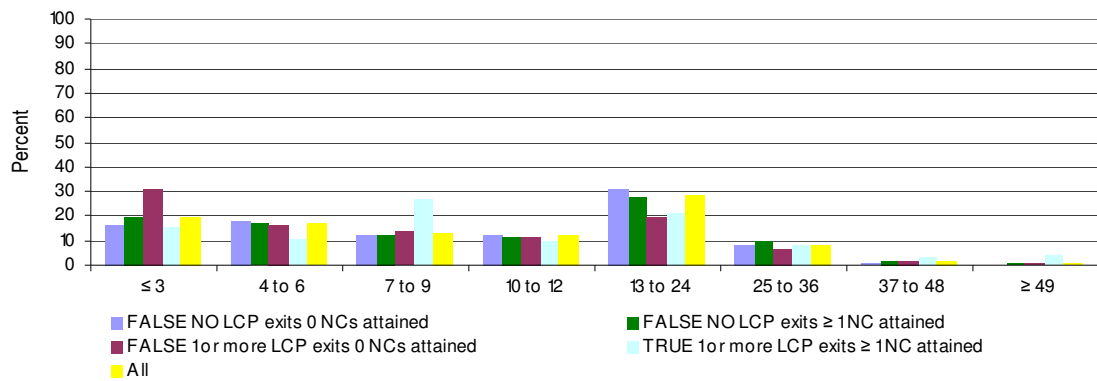
Source: Tertiary Education Commission

An examination of the total time spent in industry training for this cohort shows that 90 percent of learners had a total duration in industry training of 24 months or less; 62 percent for 12 months or less. The TRUE / FALSE conditions referred to in Figure 30 refers to whether the learner attained a national certificate or not.

The test that learners who take up limited credit programmes require more time on average than this window to attain national certificates than those who study in national certificate programmes has been partially disproved: those who attained a national certificate with at least one LCP exit were more likely to be concentrated in the lower total duration categories than those who did not exit an LCP, but attained 1 or more national certificates, providing further evidence to support the hypothesis. However, the only way to definitively ascertain whether limited credit programmes are used as stand-alone programmes would be to re-examine this data when more full years of data are available.

3.5 Age at exit

The probability of attaining a national certificate at each exit varies between age groups. The average national certificate attainment for 15 to 19 year olds at programme exit was 0.25, while for 40 to 49 year olds, it was 0.34. These probabilities vary between ethnic groups, with 15 to 19 year old Pasifika and 'Others' much more likely on average to attain a national certificate (0.46 and 0.47 national certificates per exit respectively) than European or Māori learners (0.23 and 0.20 respectively).

Figure 31: Proportion of exits with national certificate attainment by ethnic group and age at exit (2003-2005)
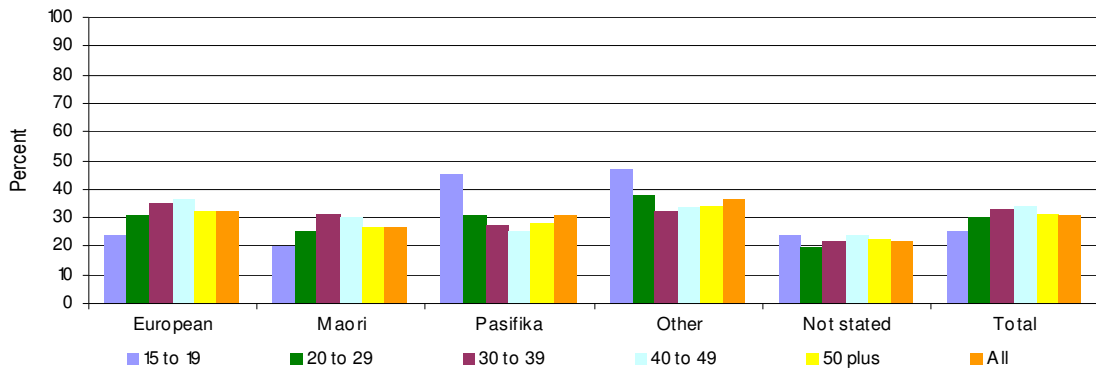
Source: Tertiary Education Commission

When average certificate attainment is measured at the learner level, by dividing the total sum of national certificates attained in each category by the number of distinct learners in each category, the relative differences between the categories regarding the average number of learners with national certificates remains the same. The smaller denominator increases the proportion of learners attaining a national certificate to 33 percent (see figure 35 below).

Figure 32: Proportion of learners with national certificate attainment by ethnic group and age at exit (2003-2005)
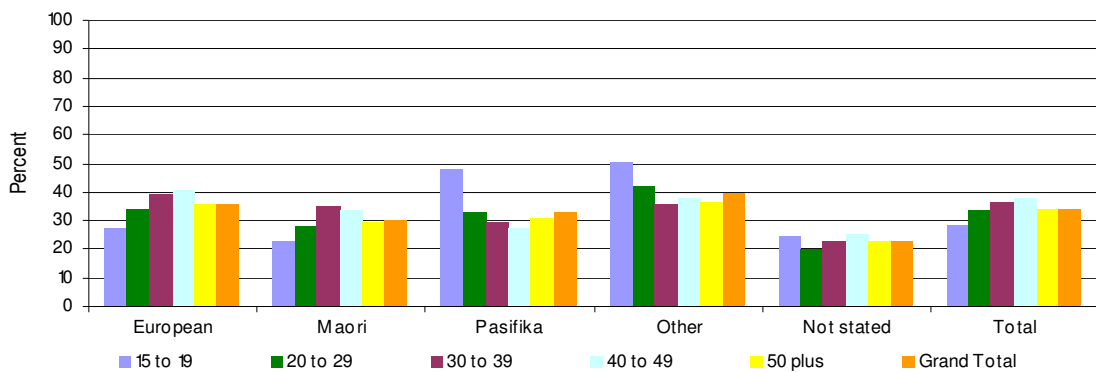
Source: Tertiary Education Commission

Again, younger learners (15 to 19 years) are the least likely to attain certification; the group most likely to attain a certificate overall are aged 40 to 49 years on exit, however, this depends on the ethnic group of the learner.

Figure 33: Distribution of national certificate attainment by age at exit (2003-2005)
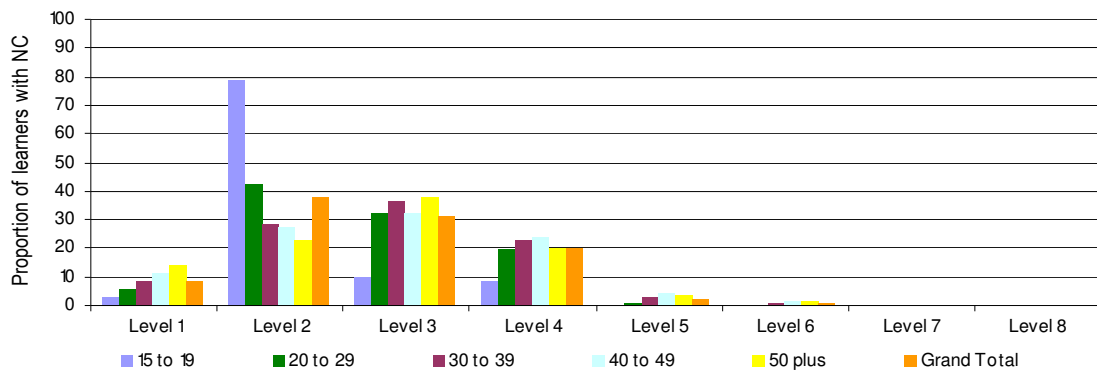
Source: Tertiary Education Commission

Figure 33 illustrates the distribution of certificates attained by NQF level, and age group. Thirty eight percent of certificates attained overall were at level 2 on the framework, the largest level grouping, while no certificates were attained at levels 7 and 8. There are differences in the distribution profile of certificate attained by level between the different age groups. For example, 80 percent of certificates attained by 15 to 19 year olds were at level 2, compared to 38 percent of the whole cohort attaining a certificate. Older learners (greater than 30 years) generally shared a similar profile: certificates attained tended to be pitched at higher levels (certificates are concentrated around level 3) than those attained by the learners under 30 years, whose certificates are concentrated around level 2.

Figure 34 shows the observed probability of attainment of a national certificate at a programme exit, by the actual duration of learning on the programme. In the input cohort section, duration was defined as the expected length of time the average learner would be involved in a programme of study. Duration for the outcome cohorts (including the national certificate cohort) is defined as the actual period of time (in months) from the enrolment in each programme until each exit. Learners are able to take programmes at varying paces, within the limitations of their employment situation and assessment arrangements. The expected duration of each programme is a guide rather than a rule, used in funding calculations as a baseline or average.

Figure 34: Observed probability of national certificate attainment at exit by programme duration and ethnic group (2003-2005)
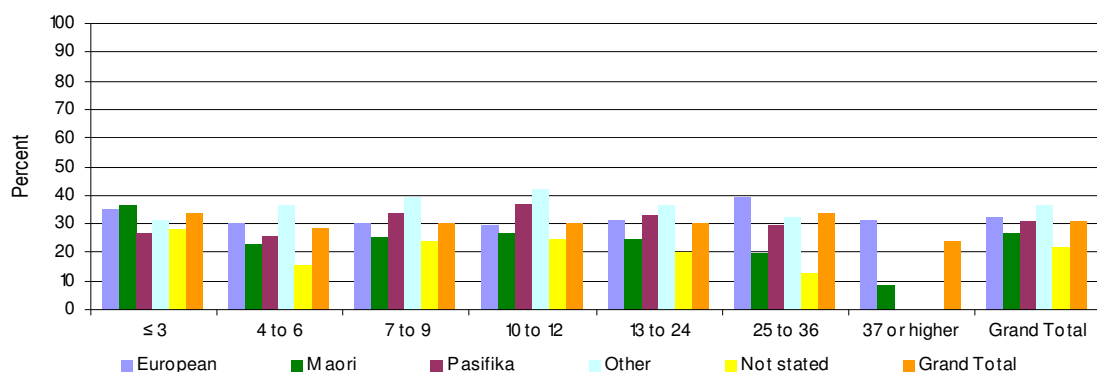
Source: Tertiary Education Commission

Figure 34 shows a variance in observed probability of attaining a national certificate at programme exit between ethnic groups, and the time it takes learners to participate in each programme. For all learners in the cohort exiting programmes, the observed probability of attaining a national certificate

coinciding with exiting a programme lasting 3 months (or less) is 0.34. For European and Māori learners, the observed probability of attaining a certificate at the same time as exiting a programme of 3 months duration is 35 percent and 36 percent respectively. Pasifika learners are more likely to exit a programme with a national certificate attached as their duration of learning on the programmes increases, than Māori learners, where an increase in duration does not have the same overall effect. Māori learners seem most likely to gain a national certificate on exit in programmes of 3 months or less.

3.6   Duration of learning

As discussed in the preceding section, programmes may be taken at varying durations of time. TEC provides an expected programme duration for each programme. This is a guide to the length of time that it would take the average learner to participate in a programme. This is mostly used in the calculation of STMs, or volume of learning, for funding purposes.

It is worthwhile to examine the average length of time taken by learners to participate in programmes, to determine the scope of industry training, and any differences between demographic groups.

Using the Exit Cohort, the average time taken participating in programmes was calculated, and cross-tabulated for each group of interest. The exit cohort is appropriate in this instance, since analysis is at the programme level. The measure of time from commencement of a programme to exit has been calculated in months. No account is made for overlapping study (where learners are enrolled in more than one programme at the same time).

For analysis at the learner level to be possible, it is perhaps more appropriate to use an approach similar to that used for the national certificate cohort, because there is a non-activity break of one year before the last year of data, which enables a determination of a break or 'finishing' industry training to be more readily made.

Problems associated with the finite window (2003 to 2005, or three calendar years) may be reduced by extending this cohort back in time by one year to 2002. This new cohort, the duration cohort, are all learners who commenced learning for the first time (according to the dataset) in 2002 or later, and whose last exit from industry training was in 2005 or earlier. This provides potentially four calendar years of activity for each learner in the cohort.

The average duration for each subgroup has been calculated for each programme, by gender, ethnicity and age at exit of programme. The final figure in this section plots the average duration in industry training, for distinct learners in the cohort.

To evaluate whether the cohort window four years is too short, the analyses in this section was repeated using 2008 year extract data. This new cohort contains data from all programme exits taking place between 2001 and 2006, which is potentially six years in which activity could take place. The cohort contains data on 180,141 exits, by 133,720 distinct learners. Using this new cohort, and comparing with the four year duration cohort, it was found that the four year duration cohort did not adequately capture the proportions of learners who took more time: the proportions at the higher margins shifted upwards slightly.

Figure 35: Programme exits in the duration cohort by ethnic group and gender (2002-2005)
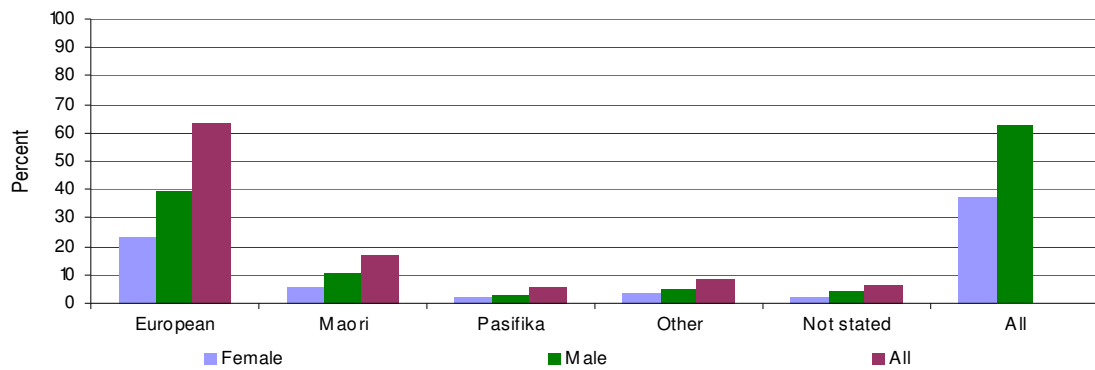
Source: Tertiary Education Commission

There are 86,631 exits in the duration cohort, involving 76, 708 learners. While learners may appear in only one of the gender and ethnic group categories, they may appear in more than one age group category, since their age advances with the passage of time. Therefore, this number is close to a measure of the number of distinct learners in the cohort (which is actually 67,008 distinct learners). To enable age to be included in this analysis, no allowance has been made for plurality in age group, except for the final figure which plots total average time spent in industry training for gender and ethnic group, excluding age group.

The gender and ethnic breakdown of the cohort is shown in Figure 35. European learners account for 63 percent of exits; Māori 17 percent; Pasifika 5 percent; 'Other' account for nine percent, and 'Not stated' account for seven percent of exits in the period. Males accounted for 63 percent; females: 37 percent. These proportions are similar to those of the enrolment cohort, and the national certificate cohort, therefore the cohort can be considered to be fairly representative.

Figure 36: Programme duration for exits by ethnic group (2002-2005)
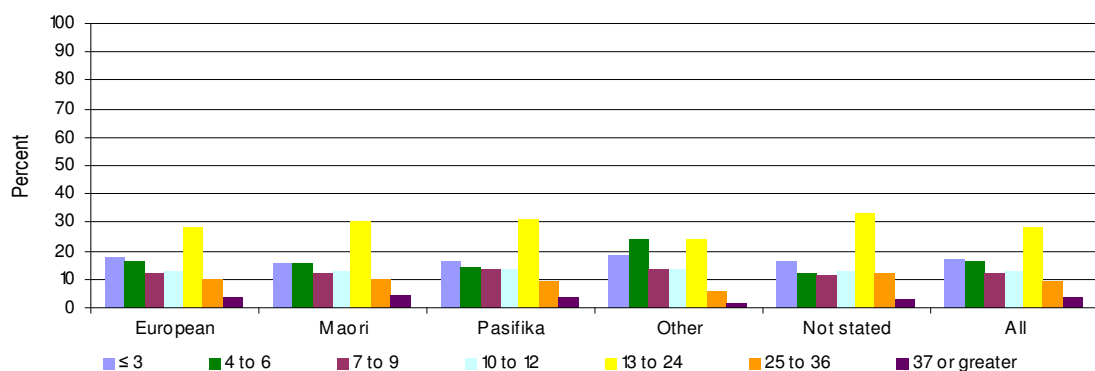
Source: Tertiary Education Commission

Figure 36 shows fairly stable exit duration profiles across ethnic groups. Most of the variance from the overall cohort profile occurs for learners in the 'Other' group, who tend to be more likely than other groups to exit from programmes using a shorter duration of time. This has little bearing on the overall profile, because they account for a small proportion of exits in the cohort (nine percent).

Figure 36a: Programme duration for exits by ethnic group (2001-2006)
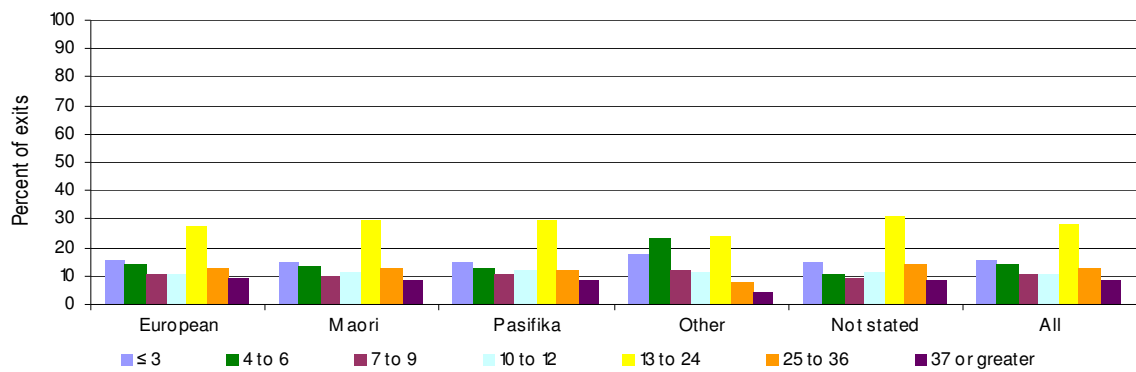
Source: Tertiary Education Commission

When compared to figure 36, figure 36a shows that the addition of two years to the cohort window makes little difference to the shape of the distribution. There is some evidence the four year window did not adequately allow the full duration to be examined: the proportion of learners who exit programmes after 37 or more months increases on average from around three percent to eight percent; and the proportions exiting programmes after 25 to 36 months increases from eight percent to 12 percent.

Figure 37: Programme duration for exits by gender (2002-2005)
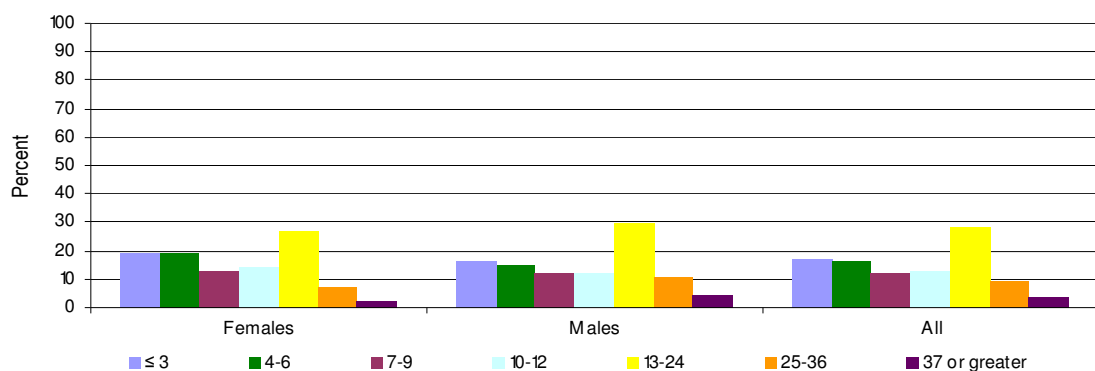
Source: Tertiary Education Commission

Figure 37 shows that female learners exiting programmes have a slightly different duration profile than males. Females are more likely to use a shorter duration than males and correspondingly, less likely than males to use a longer duration. This may be a consequence of the concentration of females in differing industries to males (see figure 16).

Figure 37a: Programme duration for exits by gender (2001-2006)
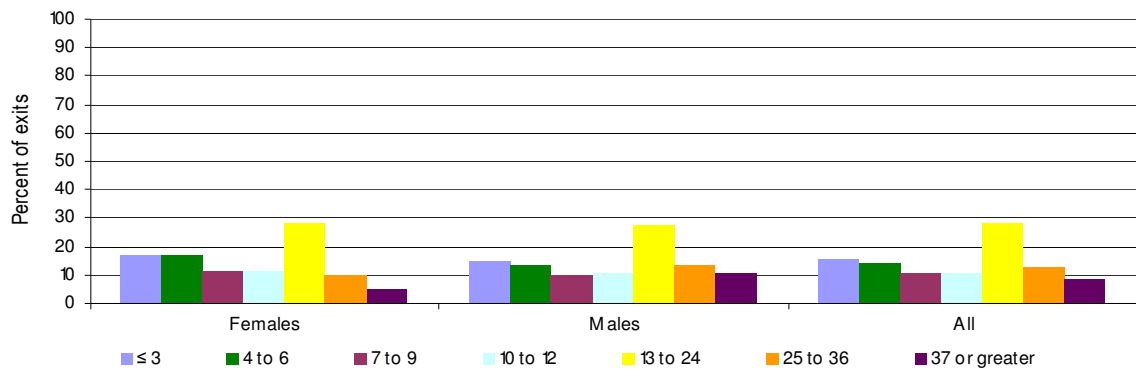
Source: Tertiary Education Commission

When compared to figure 37, figure 37a shows that the addition of two years to the cohort window makes very little difference to the overall distribution of duration. There is some evidence the four year window did not adequately allow the full duration to be examined: the proportion of learners who exit programmes after 37 or greater months increases on average to around five percent for females and 10 percent of males; and the proportions exiting programmes after 25 to 36 months increases to 10 percent for females and 13 percent for males.

Figure 38: Programme duration (months) for exits by age group (2002-2005)
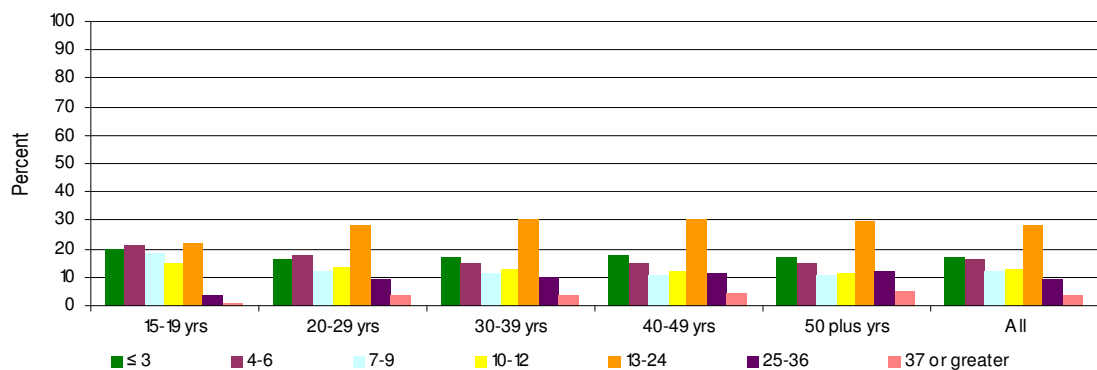
Source: Tertiary Education Commission

Figure 38 shows the distribution of exits for different age groups, for duration in programmes. For all learners, the majority of exits include a duration time of less than 12 months. Generally, younger learners (15 to 29 years) are more likely than older learners (30 or over) to take a shorter period of time (nine months or less) before they exit programmes.

Figure 38a: Programme duration (months) for exits by age group (2001-2006)
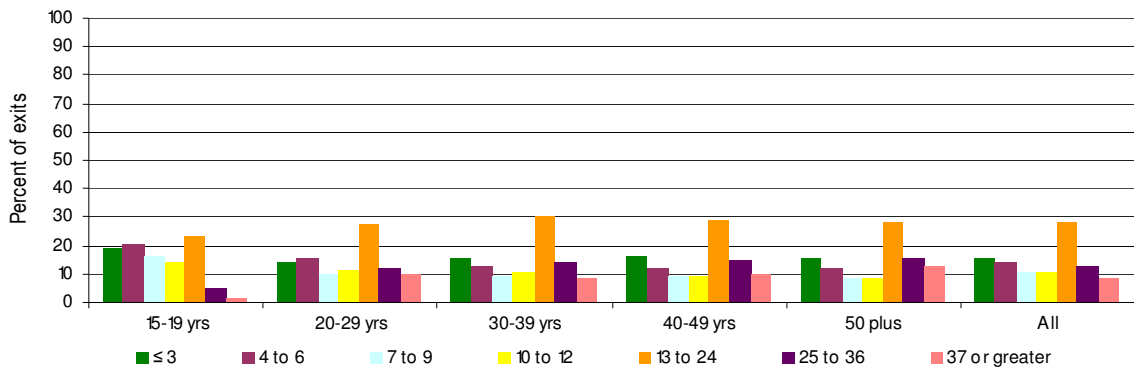
Source: Tertiary Education Commission

When compared to figure 38, figure 38a shows that the addition of two years to the cohort window makes very little difference to the duration exit profile by different age groups. There is some evidence the four year window did not adequately allow the full duration to be examined: the lengthening effect occurs fairly evenly across the age categories, except for the very youngest learners.

Figure 38b: Total average duration (months) in all industry training programmes (in the four year duration cohort window)
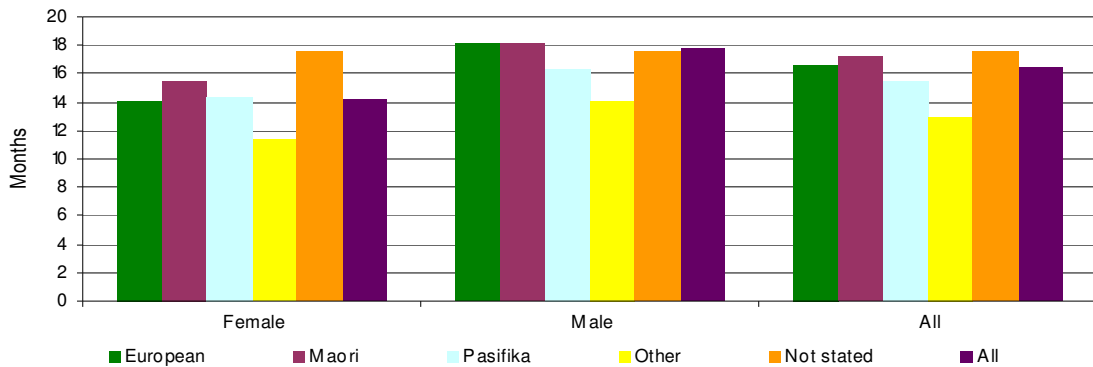
Source: Tertiary Education Commission

Figure 38b above plots the average total time spent in industry training (within the possible duration cohort window of four possible years), for distinct learners in the duration cohort. This is total time, rather than linear time: some of this time may overlap.

This rate is derived by summing all actual time in programmes by learners in the cohort, and dividing by the number of distinct learners to obtain an average for each classification. Another method to use could be to take the total length of time, from 'first contact' to 'last exit' date for each learner: this would tend to lengthen the average time because it would also take any 'breaks' in learning into account.

The average duration overall was a little over 16 months in total; this varied by gender (the average for women was a little over 14 months, while for men, it was just under 18 months) and by ethnic group (Pasifika and 'Other' learners spent shorter periods of time in total than European or Māori learners).

Figure 38c: Total average duration (months) in all industry training programmes (in duration cohort window 2001 - 2006)
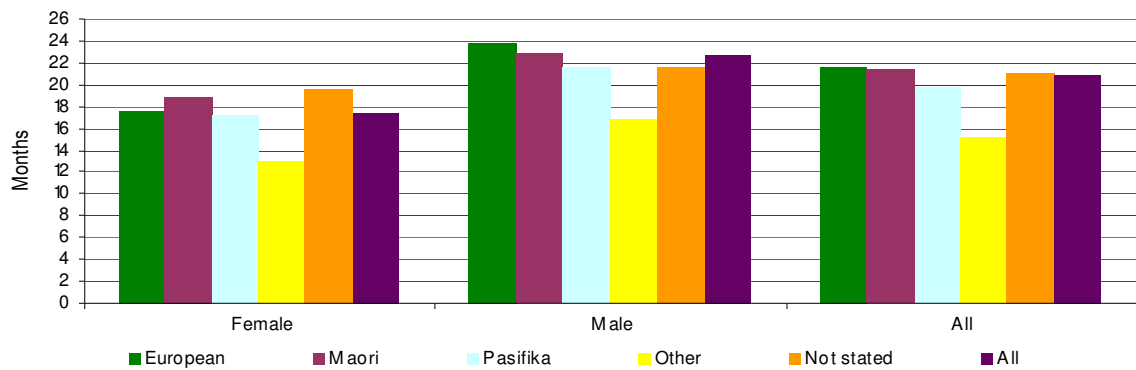
Source: Tertiary Education Commission

Figure 38c above plots the average total time spent in industry training (within the possible duration cohort window of six possible years), for distinct learners in the 2001 to 2006 duration cohort. The additional cohort window increases the average time spent in industry training. The average overall time spent in industry training per learner was a little over 21 months in total; this varied by gender (the average for women was a little over 17 months, while for men, it was just under 23 months) and by ethnic group (Pasifika and 'Other' learners spent shorter periods of time in total than European or Māori learners).

4.   Programme completion

This section examines the trends among learners who exited a programme between 2001 and 2006, using the exit cohort.

There are a number of possible outcomes for each programme enrolment. Programme activity is deemed to have ended when an ITO reports to TEC an exit date for the enrolment, along with an exit indicator code. These codes signify:

- programme completion ('Completion')
- programme termination ('Terminated')
- transfer to another programme ('Transferred')
- expiry of enrolment ('Expired')

In practice, many learners' activity comes to an abrupt halt and they are not reported on subsequently: learners may be reported by the ITO as active in one quarter, and then not be reported in subsequent quarters – they simply disappear from the dataset. Where this occurs, these have been coded as 'Unknowns', and a tentative exit date has been calculated using the date of the end of the proceeding quarter.

Between 2001 and 2006, there were:

- 345,260 programme exits (the outcome of which is either known or unknown)

An "unknown" exit occurs when an ITO reports activity in one year, but does not report any subsequent activity, or any associated exit date or exit indicator. Between 2001 and 2006, there were 44,483 (12.9 percent of all exits) exits from programmes where the outcome was unknown.

The observed probability of each programme outcome for each exit, is graphed and analysed by each variable of interest. The observed probability of each programme outcome for each exit by ethnic group is shown in figure 42 below.

In sections 5, logistic regression analysis provides predicted probabilities for each outcome by each variable: these are different to the observed probabilities (an explanation of the difference is given in the logistic regression section).

Programme outcome does not describe the totality of experience in industry training: learners may embark on several programmes to fulfil the learning requirements of their training agreement or plan. However, due to the data collection (discussed in previous sections of this report), the unit of analysis has had to be limited to programme exits. An average across all programmes (as this is) can provide a good indication of the totality of industry training experience, nonetheless.

A further complication is that, when ITOs change programme specifications, they withdraw all learners from these programmes, and it is thought that a termination code is assigned to these exits. Learners are re-enrolled in the new programme, and proceed normally. To control for this situation, Figure 43 shows the recalculated proportions for learners who enrol in just one programme throughout their industry training experience.

Figure 39: Programme exits by exit indicator and ethnic group (2001-2006)
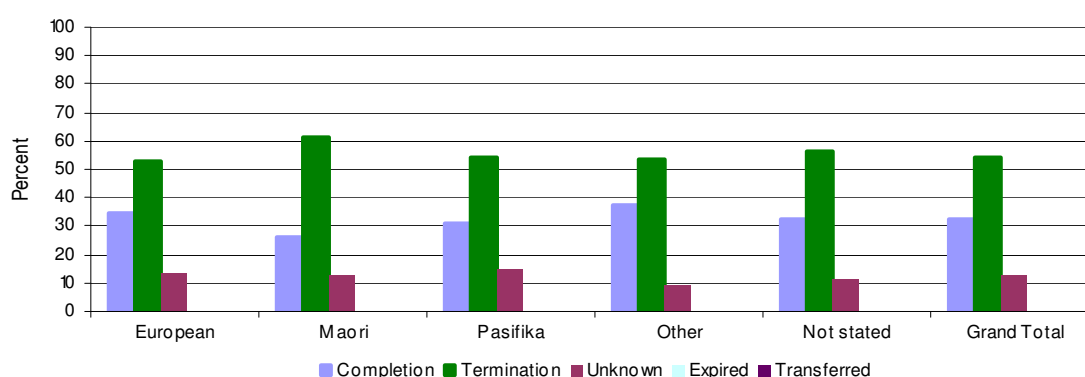
Source: Tertiary Education Commission

Figure 39 shows that, for all learners, the probability of learners attaining a completion at each exit was 0.33, or 33 percent. In some cases, the exit would have been after one year, in other cases after two years, … and in some cases after five years of training. This differs between ethnic group, with both Māori and Pasifika less likely than European learners to attain a completion indicator at their programme exit.

The probability of a programme ending due to termination was 0.54, or 54 percent. For Māori, that proportion was 61 percent; for Pasifika learners, 54 percent. The rate of drop-out (exit unknown) was 13 percent overall, and highest for Pasifika learners, at 15 percent of programme exits.

Figure 43 below shows the distribution of programme exits for learners who only studied in one programme. This group consisted 134,620 exits, accounting for roughly a third (39 percent) of all exits.

When compared to provider-based learning at comparable levels (Levels 1 to 3 and Level 4), the probability of programme completion for industry training is within the same range (see Table five below).

Table 5: Provider-based tertiary education qualification completion rates after 3 years by qualification level and year of study

Start year	2001	2002	2003	2004
Qualification level				
Level 1-3 Certificate	31%	33%	39%	38%
Level 4 Certificate	35%	40%	41%	35%

Source: Ministry of Education

Note: Table compiled using the Ministry of Education qualification completion data held on *Education Counts* website.

The numbers in Table five are not strictly comparable with the observed probability of 0.33 that a programme exit is a successful completion as the latter occurs over variable lengths of time. Table six adjusts for this by confining our attention to those who started in 2003 (for the first time) and looks at whether there had been a successful completion by 2007.

Table 6: Estimated probability of successful completion within five years for those who started in 2003[10]

Industry training, including modern apprenticeships	0.35
Students in Level 1-4 certificates in provider-based learning	0.34

Source: Ministry of Education
Notes:
1. industry training figure is an estimate of a learner completion rate, allowing five years from first activity in industry training.
2. The figure for the provider-based education is not quite comparable because it includes full-time students and part-timers, whereas in industry training, all students, by definition, undertake their formal study on a part-time basis.

While the completion rate for provider-based tertiary education at this level is around 34 percent, that figure includes full-time and part-time students, whereas all industry trainees are, by definition, part-time – balancing their studies with work commitments. Ministry of Education analyses show that in provider-based tertiary education, being part-time reduces the probability of completion.

These rates compare favourably with equivalent types of learning in other countries. For example 'Framework' completion rates for industry training in England ranged between 27 and 40 percent (on average) between 2003 and 2005. Australian rates generally sit at around 45 percent, on average, but are calculated using different methodologies to the New Zealand rates, so are not strictly comparable.[11]

The following section looks at programme exits by learner and industry characteristics.

Figure 40: Programme exits by exit indicator and ethnic group (2001-2006) for learners exiting one programme only
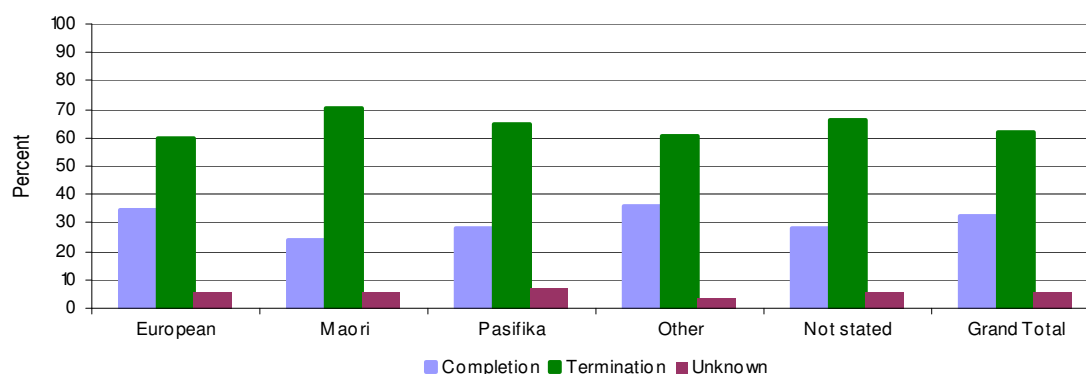
Source: Tertiary Education Commission

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10 Due to maturing data collection methodologies, 2003 cohort data is probably the most reliable at this point.
11 'The Australian and New Zealand rates are not strictly comparable. For example, the Australian rates are calculated as total completion rates for learners over at least 7 years, while the NZ rates are for 5 years from commencement. The Australian rates also exclude learners with unknown outcomes from the calculation, while the NZ rates do not. An attempt to replicate the Australian methodology, applied to the NZ data, for learners commencing in 2001, show the NZ rate at 39.1 percent (the Australian rate is 50.9 percent). Caution should still be exercised when comparing these rates: not enough is known about the methodology used to calculate the Australian rates'.

Even when excluding all learners who study in more than one programme (to try to control for the programme change scenario), the proportion of exits for each activity remain similar. Thirty two percent of exits culminate in a 'completion', while 62 percent end in a 'termination' (up from 54 percent for all exits). The overall proportions that are 'unknown' have reduced to six percent overall (from 13 percent) with the exclusion.

The unknown proportion may be smaller for the learners who do just one programme, for a number of reasons. It may be that they are more likely to try to finish their programme, because they are only envisage doing one programme. However, these learners have a lower probability of completion on average than for all exits.

It may be that a fair proportion of the 'unknowns' are in fact those who are transferred on to new programmes by ITOs when existing programmes are changed, rather than terminations. Because these learners do only one programme in total, they have not, by definition, been subjected to the transfer/change scenario. If the transfer /change scenario accounted for a large proportion of the terminations for the whole cohort exits, it would be expected that the proportion of exits that are terminations would reduce when the transfer/change scenario is controlled for. This seems to indicate that it is likely that ITOs actually leave enrolments hanging (to be classified as unknowns) and enrol learners into new programmes rather than withdrawing learners with a 'termination'. In fact, the proportion that are terminations has increased by eight percentage points, while unknowns have reduced by seven percentage points.

Figure 41: Observed probability of programme outcome by volume of training (STM) (2001-2006)
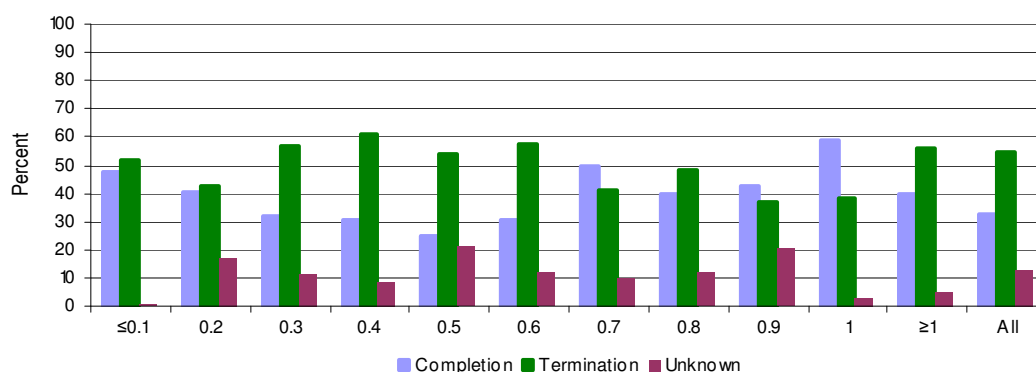
Source: Tertiary Education Commission

The probability of completion varies by the STM level of the programme. STM level is the volume of learning undertaken in each programme, to a measure of 120 credits per learner, per year (planned volume, not actual). Figure 11 illustrates that most learners study at a rate of between 0.2 and 0.6 STMs. Figure 41 shows that completion is the most likely outcome to occur in programmes that are at STM rates 0.7, 0.9 and 1. At all other STM rates, the most likely outcome is termination. Unknown outcomes occur most frequently (proportionally) in 0.2, 0.5 and 0.9 STM rate programmes.

Using the national certificate cohort, it is possible to determine the probability of programme outcome by the number of national certificates attained. TEC's instruction to ITOs is that a programme should not be reported as completed, unless at least one national certificate is attained in the process.

Figure 42: Observed probability of programme outcome by reported number of National Certificates attained in programme (2003-2005)
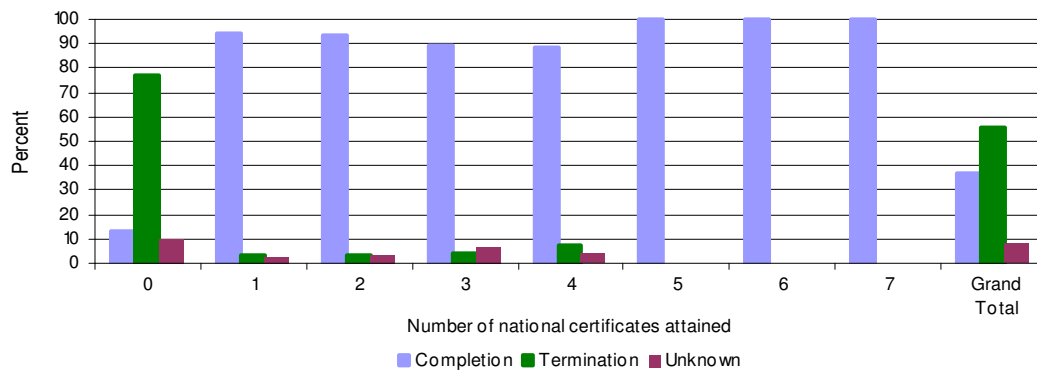
Source: Tertiary Education Commission

As would be expected, Figure 42 shows that the likelihood of termination is highest in programmes where a national certificate is not attained (Figure 26 illustrated that approximately 30 percent of programme exits coincided with national certificate attainment). There are programmes where a certificate is attained, but a termination or an unknown code is reported for the learner at exit. This could reflect that learners may attain additional national certificates by achieving additional credits to the original qualification credit load (but then not entirely complete the rest of their programme).

The completion could also occur after the learner severs contact with the ITO, for instance, if the learner changes job or if he/she completes their national certificate through a polytechnic.

Figure 43: Observed probability of programme outcome by credit load in programme (2001-2006)
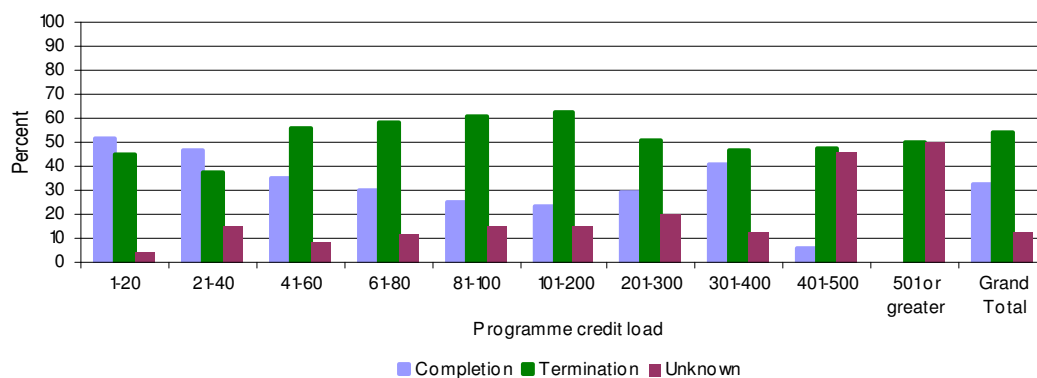
Source: Tertiary Education Commission

Figure 43 shows the probability of attaining each programme outcome, by the credit load of each programme. Perhaps unsurprisingly, programmes with low credit loads (less than 40 credits) are the most likely to attract a completion outcome for learners. For programmes with higher credit loads, the most likely outcome is termination. Programmes with very high credit loads (401 or greater) attract a high attrition rate, with the majority of outcomes split almost evenly between termination and unknown outcomes.

Figure 44: Observed probability of programme outcome by reported number of credits attained in programme (2001-2006)
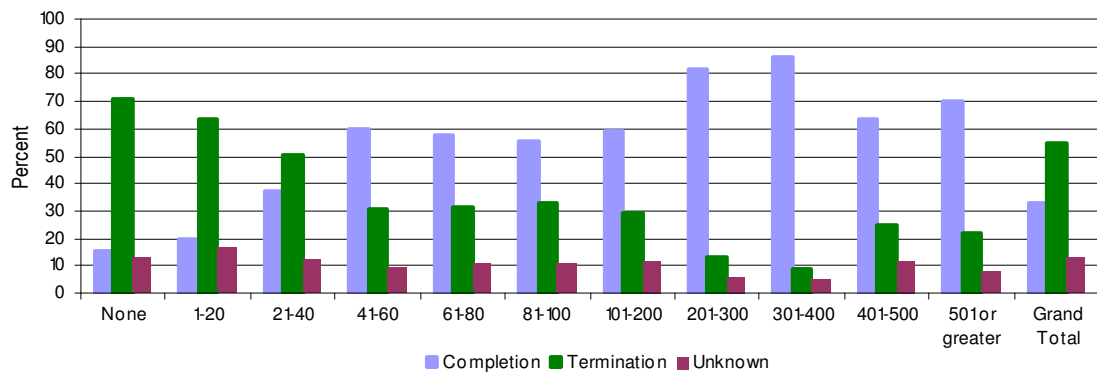
Source: Tertiary Education Commission

Figure 44 shows the probability of attaining a programme outcome by the sum of credits attained on that programme. In general, the pattern seems to be that the more credits that are attained, the more likely it is that the outcome will be a completion. Programmes exits where 40 credits or less are attained are the most likely to end in termination. The probability that the programme will end with an unknown outcome is fairly constant across all the credit attainment categories, suggesting that attainment of an unknown is not correlated with credit attainment.

The lack of similarity between the credit load categories of programmes, and the actual credits attained in terms of probability of outcome is interesting. Figures 43 and 44 show that the higher the credit load of a programme, the more likely the programme is to end in a termination, and that the more credits attained on a programme, the less likelihood of a termination. This makes intuitive sense in that learners are more likely to fulfil the criteria of their programme if they have attained a level of credits, but are more likely to drop out of higher credit yield programmes without finishing them.

It implies an inverse relationship exists between the credit load of programmes, and the actual credit attainment. The average credit attainment per exit does increase with the credit load of programmes, but not at a steady rate.

Figure 44A: Average credit attainment by credit load of programme (2001-2006)
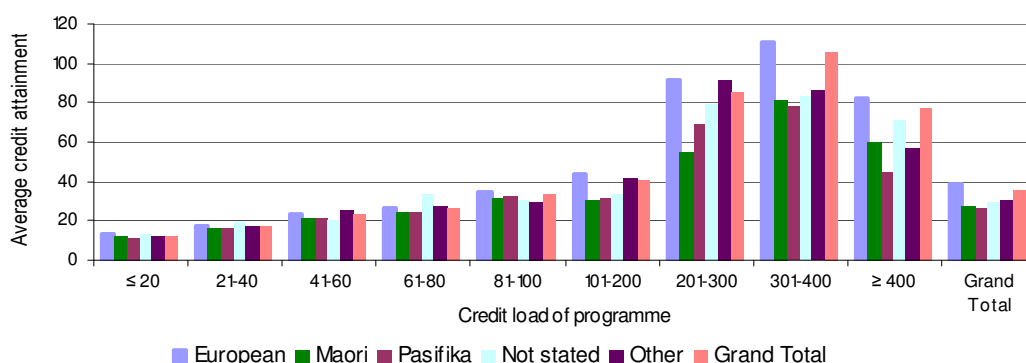
Source: Tertiary Education Commission

A correlation analysis between credit load and sum of credits attained produced a Pearson's correlation coefficient of 0.39, suggesting that there is a relatively weak overall relationship between the credit load of a programme, and the number of credits attained. Figure 44A shows a difference in the average attainment of credits, by credit load and ethnic grouping. For higher credit loading

programmes (over 200 credits) there is a difference in attainment of approximately 30 credits attained by European learners, over learners of other ethnic groups.

Figure 45: Observed probability of programme outcome by expected duration (months) of programme (2001-2006)
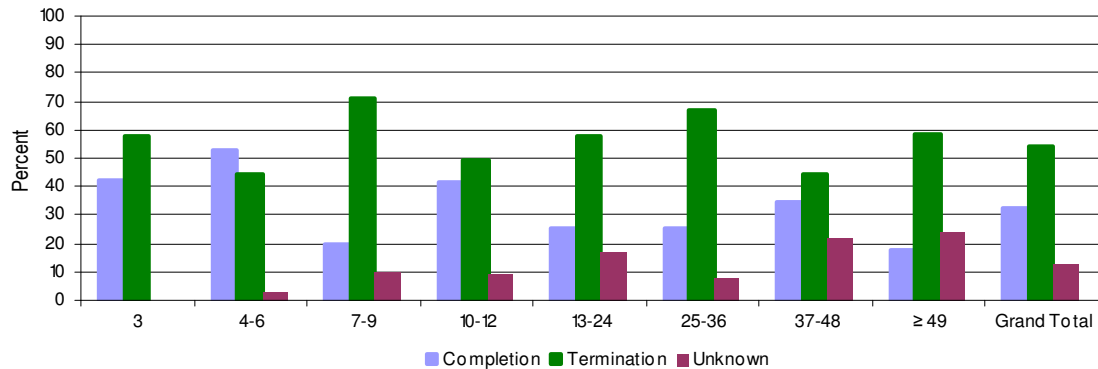
Source: Tertiary Education Commission

Figure 45 shows the probability of attaining a programme outcome by the expected duration of each programme. Programmes expected to last for 4 to 6 months are the only category of programme where a completion was the most likely outcome. The longer the expected duration of the programme, the more likely it became that an unknown outcome would occur.

Figure 46: Observed probability of programme outcome by actual duration on programme (2001-2006)
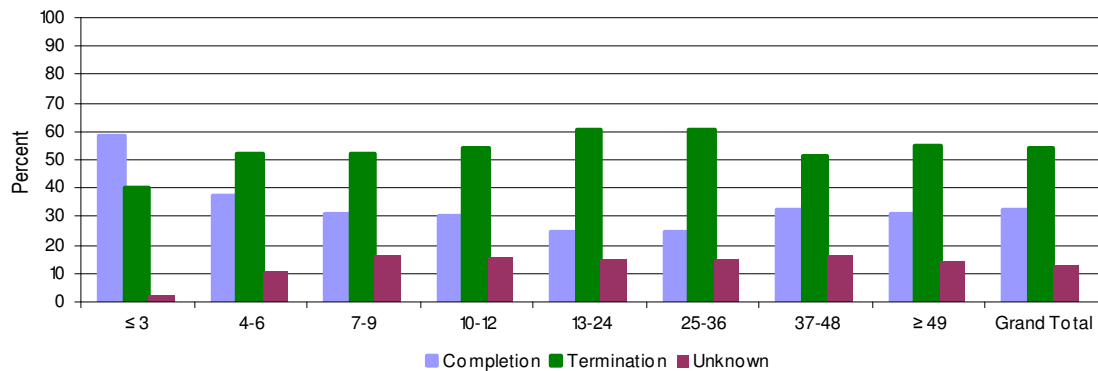
Source: Tertiary Education Commission

Figure 46 shows the likelihood of attaining a programme outcome for learners by the actual time spent on each programme. Those learners exiting a programme of three months or shorter duration are most likely to attain a completion at the end. For all other durations, termination is most likely, by varying degrees.

Figure 47: Observed probability of programme outcome by gender (2001-2006)
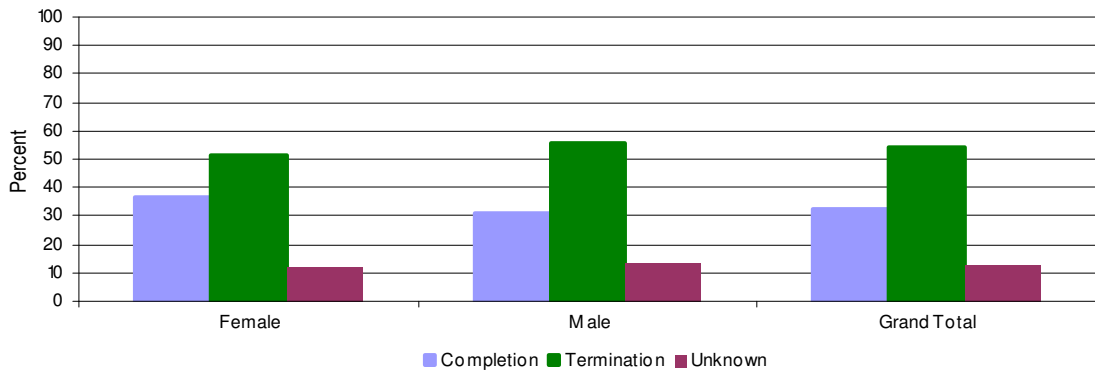
Figure 47 shows that there is a difference between the likelihood of attaining a programme outcome, depending on the gender of the learner. Both males and females are most likely to exit a programme with a termination. The observed likelihood of attaining a completion is higher for females (0.37) than for males (0.31) and the likelihood of attaining an unknown outcome (or dropping out due to changing jobs or other reasons) is 12 percent and 13 percent respectively.

Figure 48: Observed probability of programme outcome by age (2001-2006)

Figure 48 shows the observed probability of attaining a programme outcome by the age of the learner when exiting the programme. The trend is that younger learners are more likely than older learners to exit with a termination. Older learners are also more likely than younger learners to attain a programme completion, or to gain an unknown outcome.

Figure 49: Observed probability of programme outcome by year of exit (2001-2006)
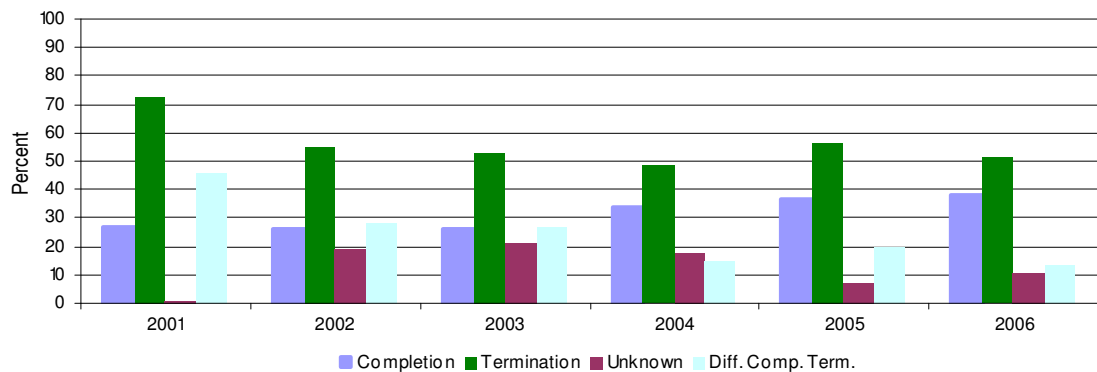
Source: Tertiary Education Commission

Figure 49 shows the probability of attaining a programme outcome, by year of exit. The difference between completions and terminations is reducing (14 percentage points for exits in 2006), from a peak in 2001 (46 percentage points). Unknown exits have reduced as a proportion of the total exits in recent years.

This could be a real effect, or could be a consequence of a gradual improvement in the collection of data and hence the data quality.

Figure 50: Observed probability of programme outcome by programme type (2001-2006)
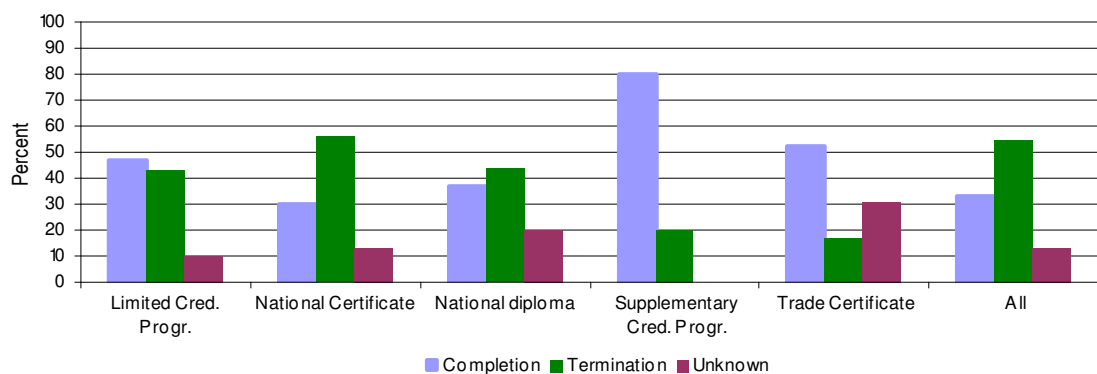
Source: Tertiary Education Commission

Figure 50 shows the observed probability of attaining a programme outcome, by the type of programme. The likelihood of attaining a completion is higher than any other outcome for limited credit programmes, supplementary credit programmes and trade certificates. Unknown outcomes are most likely to occur in trade certificate programmes, and national diploma programmes. They do not occur in supplementary credit programmes.

## Figure 51: Observed probability of programme outcome by programme level (2001-2006)
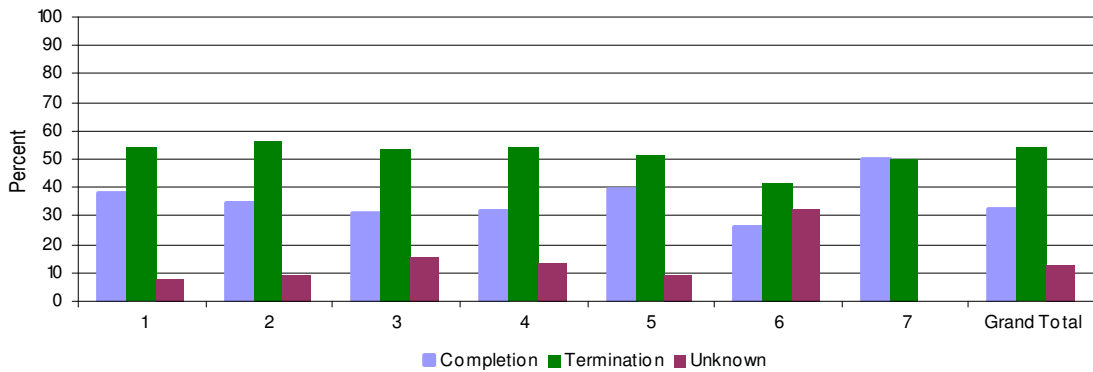
Source: Tertiary Education Commission

Figure 51 shows the observed probability of attaining an outcome, by the level of each programme. Programmes exits at all levels, bar level 7 (which accounted for only 2 exits), were most likely to coincide with a termination. The level of exits that are indicated as 'dropping out' (unknown) was proportionally the highest for exits at level 6, however, level 6 exits only accounted for 0.44 percent of all exits.

Figure 52: Observed probability of programme outcome by ITO (2001-2006)
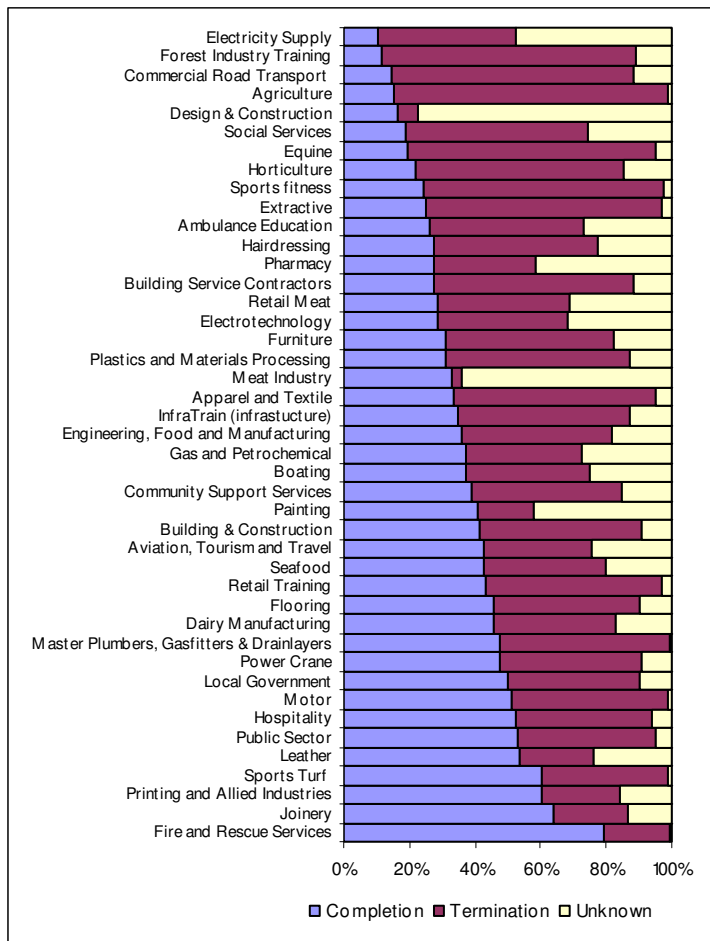
Source: Tertiary Education Commission

Figure 52 shows that there is variation between industry training organisation regarding the observed probability of outcome at each programme exit. Perhaps most notably, several industries have high proportions of outcomes that are unknown (meat industry, design and construction), compared to other industries.

Figure 53 shows the probability of each programme outcome, by ITO size (total number of learners in the dataset) quartile ranking. ITOs were ranked on size, and assigned almost equally to 4 groups: 4 is small, 1 is large (4 is 25th percentile or below, 3 is between the 26th and the 50th percentile, 2 between the 51st and the 75th percentile, and 1 is between the 76th and the 100th percentile).

Figure 53: Observed probability of programme outcome by ITO size rank (2001-2006)
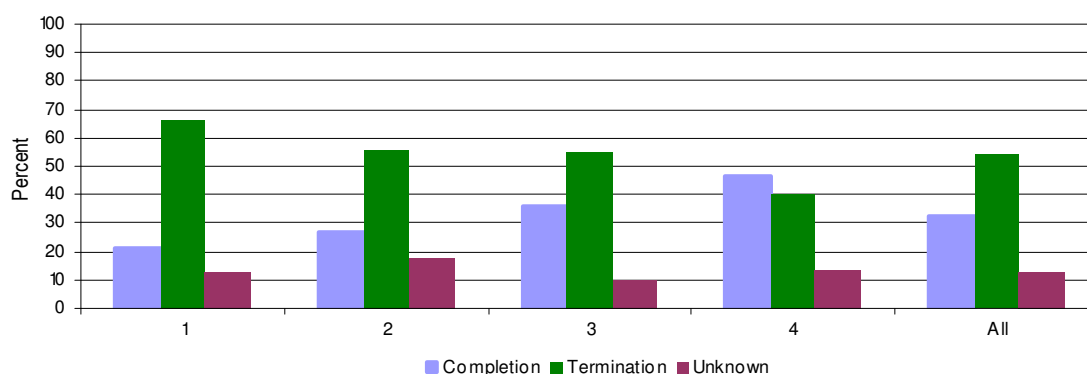
Source: Tertiary Education Commission
Note:
1 signifies the largest ITO quartile ; 4 the smallest ITO quartile

Figure 53 shows that there is a difference in terms of observed probability of outcome, based on the ranking of ITOs by the number of learners. Learners exiting ITOs with larger numbers of learners are less likely to gain a completion on exit than from the smaller ITOs. The smaller ranked ITOs are the only category where a completion is the most likely outcome for learners at programme exit.

4.1   Modern Apprenticeships Fund

Table 7: Modern Apprenticeships enrolments and exits 2001 to 2006

Year	Enrolments	Number of exits
2001	1,481	402
2002	2,440	673
2003	2,389	1,250
2004	2,784	2,347
2005	3,093	2,817
2006	3,712	3,797

Table seven shows the number of enrolments and exits from Modern Apprenticeships, by calendar year. Apprentices are involved in the programme for a number of years (apprenticeships are

supposed to run over approximately 4 years). As the programme commenced in 2001, the first wave of 'real' exits would be expected in 2004/2005. All exits prior to 2004/2005 are likely to be learners who did not complete their programme of study. By the later years, enrolments and exits have reached more of an equilibrium.

Figure 54 shows variation between programme outcomes between the different strands of industry training. Learners exiting programmes in the Modern Apprenticeships strand were less likely than the whole to attain a completion. However, care should be taken in interpretation of comparisons of aggregate exit proportions with industry training as Modern Apprenticeships is, at this stage, a relatively young programme.
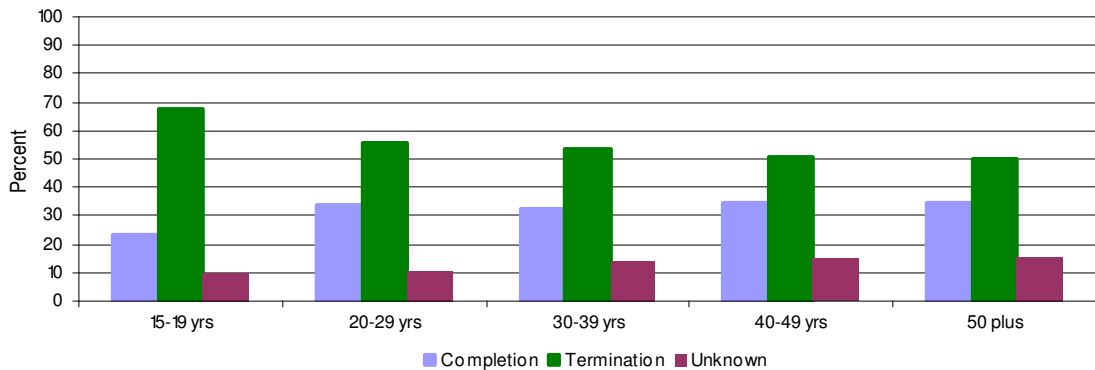
Figure 54: Observed probability of programme outcome by fund (2001-2006)
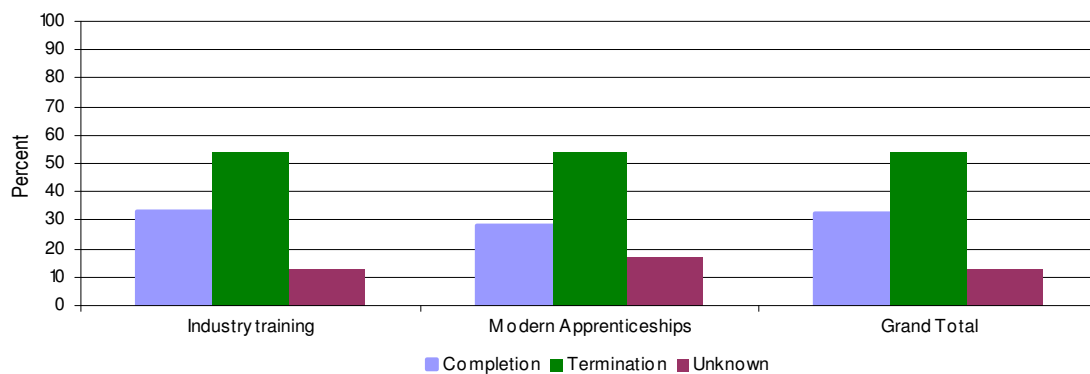
Source: Tertiary Education Commission

Modern Apprenticeships differs from industry training in several key ways. Modern Apprenticeships is targeted towards younger learners: 15 to 21 years (with the possibility of participation by older learners); and additional mentoring/support through the coordinator role.

Administratively, learners are supposed to be more likely to study in only one programme to fulfil their training agreement (industry training learners may study in several). During the period (2001 to 2006) there were a total of 15,899 enrolments and 11,286 exits from the Modern Apprenticeship programmes. Figure 58 shows that in actuality, there is little difference between the strands in terms of the number of programmes that learners enrol in (programmes enrolments can be for both strands). It is not known whether it is the learners themselves who enrol in multiple programmes, or if multiple enrolments are made for administrative reasons (such as the change/transfer scenario).

Figure 55: Number of programme enrolments per learner for exit cohort by fund (2001-2006)
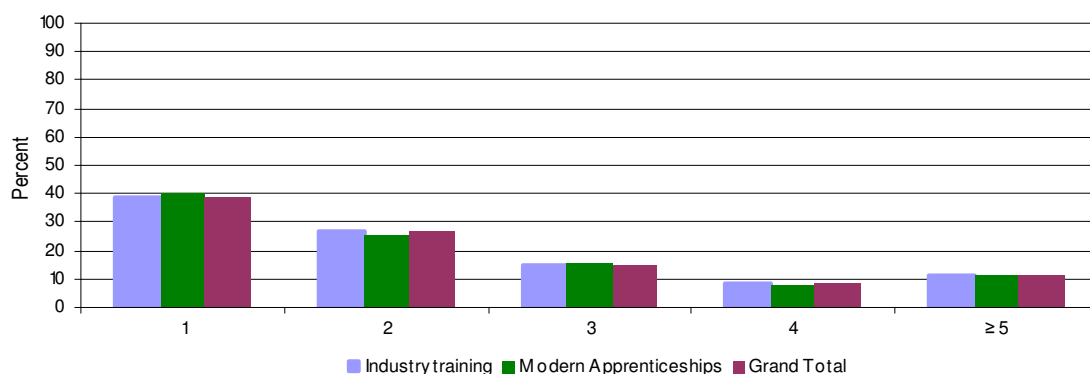
Source: Tertiary Education Commission

This categorises learners by the number of programme enrolments, grouped by fund (at the time of enrolment). Each learner may enrol in a number of programmes, not necessarily just in the one fund.

In terms of the number of programmes that learners exit, there is a difference between strands. Modern apprenticeship learners are more likely than other industry training learners to exit just one programme (83 percent to 70 percent for industry trainees).

Figure 56: Number of programme exits per learner for exit cohort by fund (2001-2006)
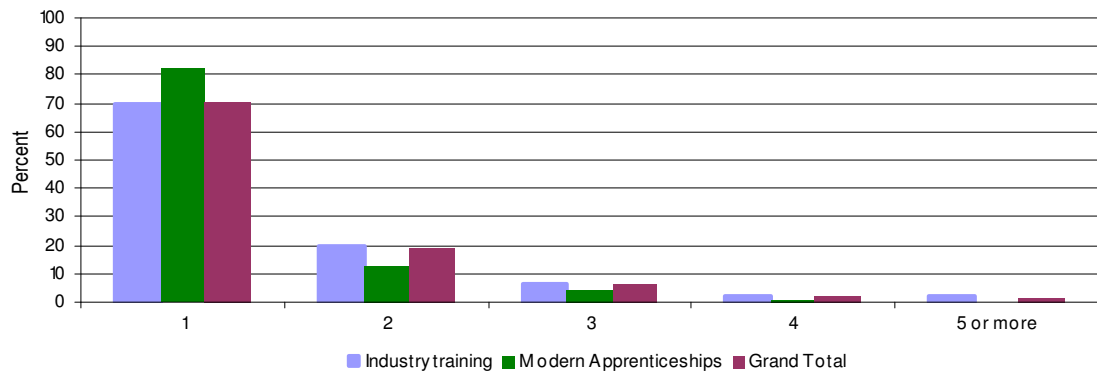
Source: Tertiary Education Commission

Therefore, the observed probability of a programme outcome, shown in figure 54, is much closer to capturing the overall outcome for Modern Apprenticeships than for industry training. In other words, it is more likely that a programme exit reflects the total programme experience for modern apprentices, because they are more likely to have just one programme exit.

Figure 57: Modern Apprenticeships programme outcomes by exit year (2001-2006)
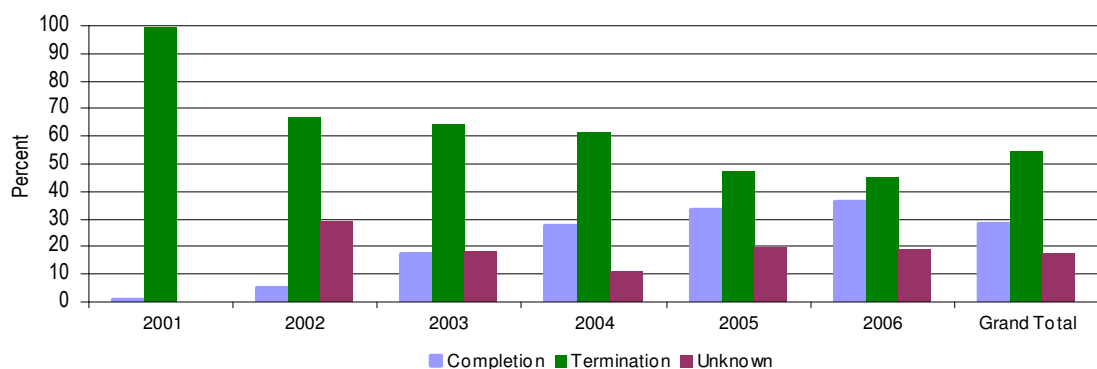
Source: Tertiary Education Commission

Modern Apprenticeships commenced in 2000 as a pilot programme, and was progressively rolled out on a national basis from 2001. Since apprenticeships take a number of years to complete, and the programme is a new one and has been developing over several years, the outcome profiles in the early years of Modern Apprenticeships will not reflect the developed character of the programme. All exits in the early years of the programme (2001, 2002, 2003) are likely to be terminations, as not enough time will have elapsed for apprentices to have completed their programmes when they exit. Exits occurring in 2005 and 2006 are more likely to accurately reflect the character of the programme.

While overall, the difference between completions and terminations for outcomes of Modern Apprenticeships seems fairy large, this encompasses the developmental effect of the programme: by 2006, exits that are completions and terminations show a near convergence, although terminations still account for a high proportion (45 percent) of programme outcomes.

Figure 58: Modern Apprenticeships programme outcomes by ethnic group (2001 - 2006)
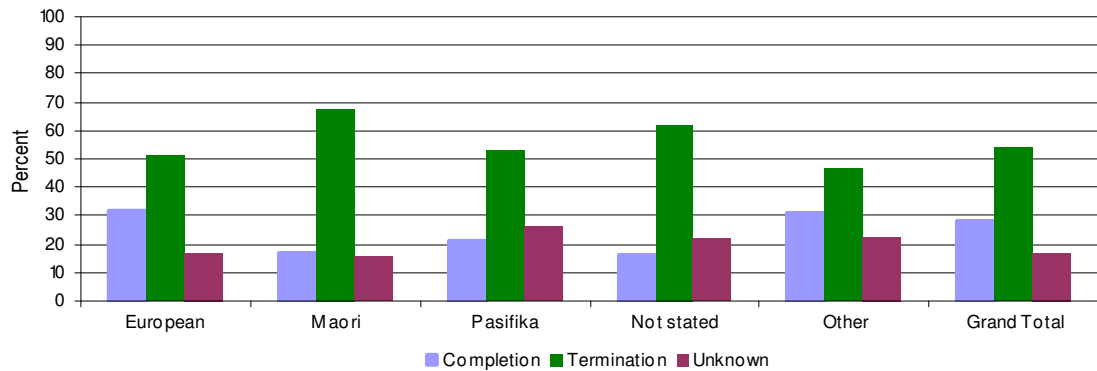
Source: Tertiary Education Commission

The probability of a programme outcome differs by ethnic group. Māori learners are more likely than European or Pasifika learners to terminate their programme. Pasifika learners are the most likely to attain an 'unknown' outcome.

Figure 59: Modern Apprenticeships programme outcomes by ethnic group (2006)
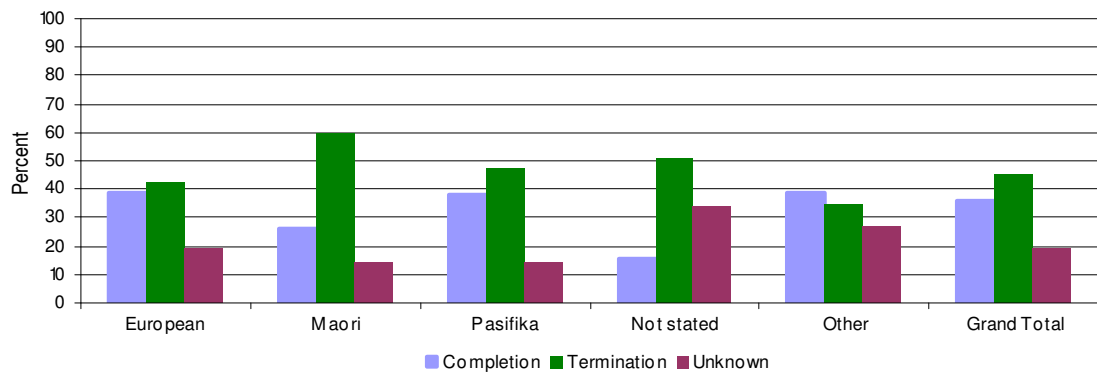
Source: Tertiary Education Commission

Data for exits in 2006 show that the most likely outcome for Māori exiting a Modern Apprenticeships programme is still a termination. For European and Pasifika learners, the gap between a completion and termination is less pronounced. 'Other' learners were the only ethnic group exiting a programme in 2006 where the probability of exiting with a completion was higher than with a termination (39 percent completion, 34 percent termination, 27 percent unknown).

Figure 60: Modern Apprenticeships programme outcomes by gender (2001-2006)
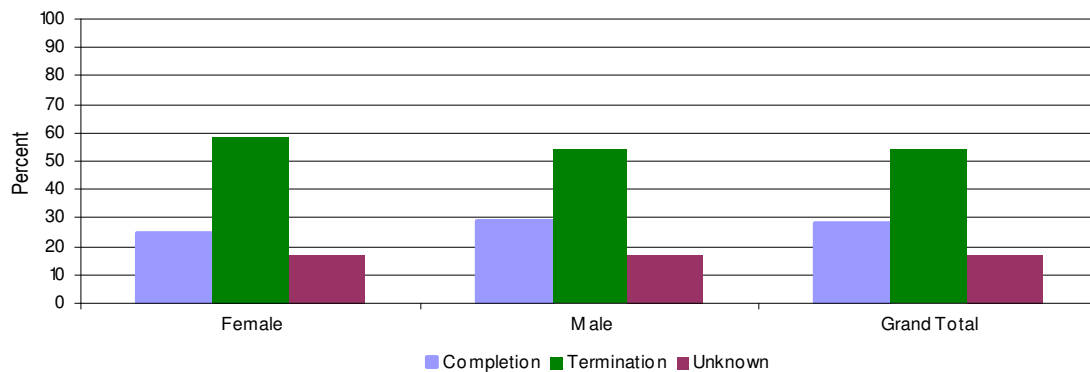
Source: Tertiary Education Commission

Figure 60 shows a difference between gender groups in terms of probability of programme outcome in Modern Apprenticeships. Females are more likely than males to exit with a termination; the probability of an 'unknown' outcome is the same for both sexes.

Figure 61: Modern Apprenticeships programme outcomes by gender (2006)
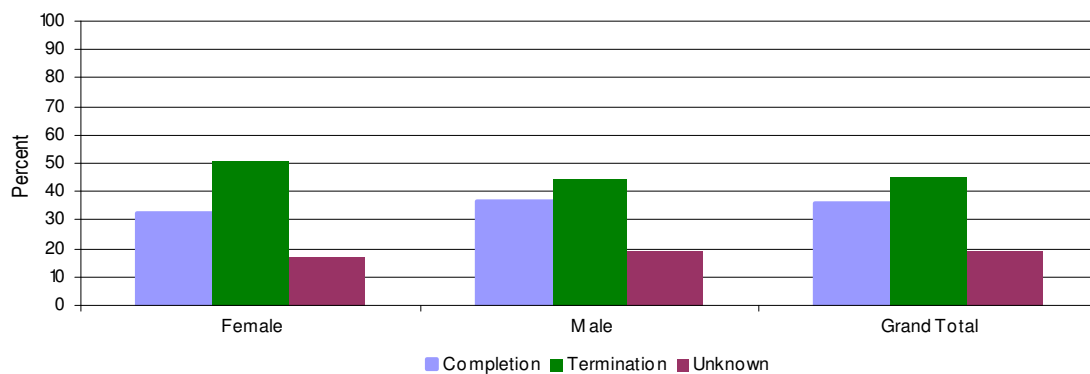
Source: Tertiary Education Commission

Figure 61 shows the likelihood of a programme outcome by gender of learner for exits occurring in 2006. Females account for 12 percent of all exits from Modern Apprenticeships in 2006 (453 exits out of a total of 3,797). Males are still more likely than females to exit with a completion, however the gap has closed when possible developmental effects are masked (by excluding exits in 2001 to 2005). Males are also more likely than females to attain an 'unknown' outcome.

Figure 62: Modern Apprenticeships programme outcomes by age (2006)
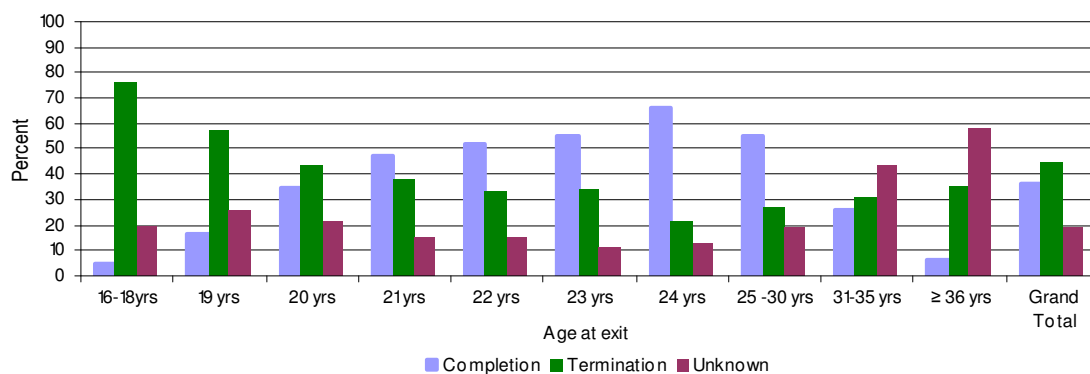
Source: Tertiary Education Commission

Data for 2006 shows a difference in programme outcome for learners by their age at exit. In general, younger learners (under 20 years of age) were most likely to exit with a termination, while learners aged 21 to 30 years were most likely to exit with a completion. Those aged 31 or over (a very small proportion of learners) were most likely to drop out as 'unknowns'.

5. Modelling programme exits

A logistic regression was performed to test the relative strengths of the factors associated with each programme exit outcome using a sample of the population of industry trainees. Logistic regression is used to investigate the relationship between sets of explanatory variables and response variables, enabling the relative contribution of each variable to be assessed, while controlling for all of the other variables within the model. The contribution can then be applied to the total population through production of probability formulae. To enable logistic regression analysis, the dependent variable programme exits was grouped into a dichotomous dummy variable, consisting of two levels: 'completion', or 'other outcome'.

The model was used to test the probability of programme completion, for all programme exits occurring between 2002 and 2007. The analysis occurred at a programme level rather than for discrete learners, however, the parameter for inclusion into the model was that the learner participated in just one programme. This allows the programme level analysis to be used as a proxy for most learners' experience in industry training.

A sampling technique, commonly referred to as 'bagging', was used to select a representative sample, once a population dataset was chosen. 100 samples of 20 percent of the dataset were taken in simple random samples, without replacement.

Backward stepwise regression is the preferred method for selection of variables to fit models in exploratory analyses, where the analysis begins with a full or saturated model and non-contributory or collinear variables are eliminated from the model in an iterative process. The fit of the model is tested after the elimination of each variable to ensure that the model still adequately fits the data. When no more variables can be eliminated from the model, the analysis has been completed.

The explanatory variables were chosen from the variables that have already been examined, and some that subsequently became available. Some variables were adjusted or excluded to eliminate collinearity, (where effects are exaggerated due to high correlations between explanatory variables, or with the dependent variable itself).

The model-selected variables included: gender, ethnic group, age (at programme exit), training fund, actual duration of programme, programme (NQF) level, proposed STM of programme, Industry Training Organisation, exit year, previous highest qualification (or equivalent), location of employment, year of exit, learner category, off-job component of programme, and dummy variables created to indicate if the programme was one of the following types: national certificate; national diploma; limited credit programme or supplementary credit programme.

The Industry Training Organisation was included, complemented by a 'field of study' variable to attempt to disaggregate some of the 'ITO' effect:

- 'Field of study' (New Zealand Standard Classification of Education, or NZSCED)– derived through data matching PMS programme names with NZQA qualification identifiers.

Other new variables include:

- 'Previous Qualification', a self-reported, and otherwise unverified measure, collected at enrolment in each programme by ITOs. This is used as a proxy measure for previous highest educational qualification attainment;

- 'Region of employment', a geographic location variable, based on the old TEC regional administrative office structure coverage around New Zealand;

- 'Learner category', which identifies whether a learner is an employee, self-employed, a volunteer, or working in the public sector. The reliability of this variable is unknown;

- 'Off-Job component', a programme attribute, which roughly assesses if each programme is likely to have an off-job component, on the basis of inclusion of the matched NZQA qualification identifier present in the Single Data Return (SDR) a data submission regime used by TEIs and other tertiary providers to signal education provision for the purposes of reimbursement of funding from the TEC. Presence in the SDR may indicate that at least some component of the programme is taught at a TEI or training provider, rather than exclusively within the workplace.

It should be noted that it is rarely possible to include every variable that might correlate with success in education data modelling. Particular omissions in this case are specific employer and industry effects; learner motivation, as well as socio-economic status.

A reference group was chosen for predictor variables to observe the predictor effects of sub-categories on the dependent variable. This enabled odds ratio for the probability of programme completion for one sub-group compared to another to be calculated, as well as the overall predicted probability for each variable iteration. Therefore, calculated predicted probabilities and odds ratios are for this reference group only, but they may apply to all, or other groups of industry training learners.

The predicted probabilities predict the probability of an event occurring for the reference category, for a change to a different value for each variable. This is attained by calculating the probability of each possible iteration of variable, and applying that to the reference learner, holding all other variables constant.

Odds ratios are calculated to show the odds of an event occurring over those of another event. Odds ratios of less than 1 indicate less likelihood than the reference category of completing their programme with a change of category, while odds ratios of more than 1 denote that there is more likelihood of completion for a different category than for the reference category.

5.1   What's missing from the model?

There are many key variables that could not be included in the regression model, for various reasons. The introduction section of this paper provides a fuller list of intangible variables.

In addition to these, it would have been interesting to measure the effects of socio-economic status on probability of programme completion in industry training. However, there is no variable that measures this, or that could be used as a proxy. Ussher (2007) used school decile as a proxy measure for SES. He found that school decile made little difference for persons transiting from school to industry training. That may suggest that socio-economic status may not be a very strong factor in determining who takes up industry training.

Industry training organisation is used as a proxy for industry, employer effects *and* ITO. This is not entirely adequate, given that the differences between the different industries are measured by the coverage of the industry training organisation, so effects due to industry/employers cannot be distinguished from organisation effects. Industry training programmes were not mapped to an occupation classification (NZSCO), and an employer identification does not exist within the dataset meaning that employer effects could not be modelled. It is thought (Curson, 2004) that some barriers to successful completion of industry training programmes are due to barriers to learning and training within the workplace, such as: size of enterprise; the value placed on qualifications;

seasonal nature of work; and strained employer/employee relationships. We are unable to formally test this at this stage, however, future research involving linking external datasets may enable this analysis.

A measure of the actual volume of training, or STMs consumed, is not included in the model, due to collinearity concerns. Measures of duration and credit attained are highly correlated with actual STMs (since actual STMs are calculated using actual duration and credits), so these have been examined separately. Predicted STMs are used as a factor in the model instead as a measure of volume of learning.

Again, it should be noted that it is rarely possible to include every variable that might correlate with success in education data modelling. It is acknowledged that this modelling is exploratory; the models are incomplete, and based on data that may be somewhat unreliable.

5.2   Reference group

Logistic regression allows comparisons between groups to be made of the probability of an event occurring: in this case, we predict the probability of a programme completion.

The comparisons are made in relation to a specific reference category group of learners. **They do not apply to all industry training learners.** However, care has been taken to ensure that the reference group chosen is typically representative of a large group of learners. Given the number of different permutations of variables, however, it is not possible to adequately represent all learners in industry training in one model: industry training it is just too diverse.

The reference category group for the model took the following values for each chosen variable, based on the typicality of the incidence in the dataset as a whole:

Gender: **Male**

Ethnic group: **European**

Fund: **Industry training**

NQF level: **3**

Sum of credits: **21 to 40**

STMs: **0.3 to 0.5**

ITO: **Forestry** - chosen because this ITO is consistently one of the largest in terms of numbers of learners

Age: **20 to 29 years**

Exit Year: **2006**

Duration on programme: **13 to 18 months**

Field of study: **Agriculture, environmental and related studies** – chosen because of typicality for Forestry ITO learners

Location of employment: **Bay of Plenty Region** – chosen because of typicality for Forestry ITO learners

Off -Job component: **Likely** – chosen because of typicality for Forestry ITO learners

Previous highest qualification: **No previous qualification** – chosen because of typicality for Forestry ITO learners

Learner category: **Employee** – chosen because of typicality for Forestry ITO learners

National Certificate dummy variable: where the value **1** signifies NC type programme delineation, against all other programme types

Limited credit programme dummy variable: where the value **Zero** signifies non-LCP programme type delineation, in line with choice of NC delineation

Supplementary credit programme dummy variable: where the value **Zero** signifies non-SCP programme type delineation, in line with choice of NC delineation

National Diploma dummy variable: where the value **Zero** signifies non-ND programme type delineation, in line with choice of NC delineation.

It is most important to note that a change in reference group would alter the predicted probabilities of completion in respect to each variable, but would have no bearing on the overall significance and predictive power of the model. What's of interest is the relative differences between the probabilities of completion for each sub-category, for this reference category of learner.

5.3   Results

The model diagnostics were favourable. The deviance of the model was not significant at the 5 percent level, indicating a good fit of the model to the data. The pseudo-R square, a measure of the explanatory power of the model, averaged 0.1755 across the 100 samples. This means that the model was able to explain 17.5 percent of the observed variability. This is a respectable level of explanation for models of educational data, where it is generally recognised that many factors external to the educational programme are also responsible for learner performance.

The hypothesis was that the variables would have no explanatory power on the outcome. The model was statistically significant overall at the 5 percent level, meaning this hypothesis was able to be rejected.

Table 8 (below) details the contribution of effect for each variable in the model, ranking on the relative importance of each variable for predicting programme completion.

Table 8: Analysis of effects

Effect	Rank	Wald Chi-Square	Probability > ChiSq
Organisation (ITO)	1	1,206.72	p <.001
Duration on programme	2	544.28	p <.001
Volume (STMs)	3	227.92	p <.001
National Certificate dummy	4	171.85	p <.001
LCP dummy	5	170.10	p <.001
NZSCED Field of study	6	162.27	p <.001
Age at exit	7	134.47	p <.001
NQF level	8	80.49	p <.001
Location of employment	9	61.78	p <.001
Previous highest qualification	10	38.87	p <.001
Ethnic group of learner	11	38.37	p <.001
Year of exit	12	32.64	p <.001
Off-job component	13	26.10	p <.001
Learner category	14	13.99	p <.001
Training fund	15	8.08	p <.001
National Diploma dummy	16	6.93	p = 0.01
Gender	17	6.26	p = 0.01
SCP dummy	18	4.24	p = 0.04

5.4 Predicted probabilities

These probabilities referred to in this section differ from the observed probabilities provided in previous sections. The logistic regression model allows us to make predictions on the probability of programme completion, allowing for the effects of all of the other variables included in the model. The contribution of each variable alone to the outcome is assessed (the observed probabilities referred to in previous sections consist of the contributions of multiple variables in combination).

This is possible by using the regression formula:

$$Y = Intercept + B_1 + B_2 + \ldots B_k$$

Where Y = probability of completion and the Betas (Bs) are the logits of each variable. The logit for each variable is transformed into a predicted probability, and the probability is calculated for each iteration.

Where predicted probabilities differ from observed probabilities (shown in the figures in the outcomes section of this paper) we can infer the influence of other variables on the effects (if our reference group is sufficiently representative). By stripping away all the effects of other variables, we are able to predict the probability of completion for each sub-group alone, dependent on the attributes of that group.

The possible combinations of variables are quite large, so this analysis is limited solely to key variables of interest. No interaction effects were modelled at this stage, however, it would be useful to follow up this study with some interaction analysis.

It is important to note that these predicted probabilities are for the selected reference group only, in comparison to the other groups. If a different reference group was chosen, the values of the predicted probabilities would change, however, the nature of the relationship between the different iterations of variables, in all probability, would not change.

5.4.1 Industry Training Organisation (ITO)

The most powerful predictor of completion of a programme was the industry training organisation variable. Figure 63 plots the predicted probability of programme completion for each ITO for which data is available within the dataset. [12]

Figure 63: Predicted probability of programme completion by Industry Training Organisation variable
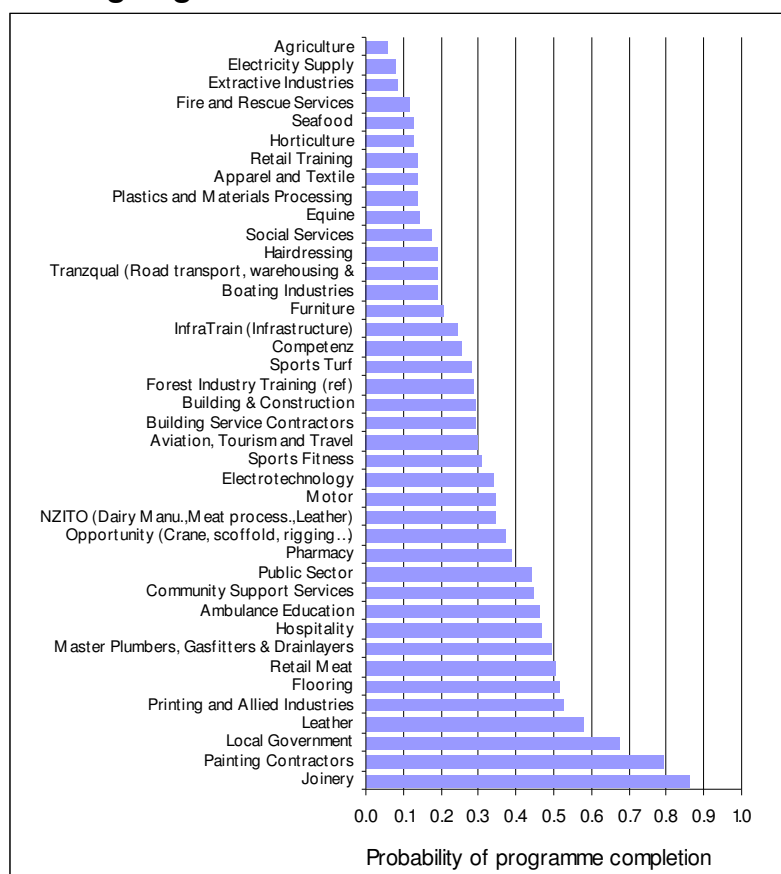
Source: Tertiary Education Commission

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[12] Due to the historical nature of these records, some ITOs shown no longer exist: they may have merged into new organisations. Where it is not immediately clear from the ITO name, industry coverage of ITO has been provided. Where data for key variables are missing *en masse* for an ITO, that ITO will not be included within the regression model. This occurs for the 'Design & Construction' and the 'Gas and Petrochemical' ITOs, for which location of employment data does not currently exist within the dataset. The names of some ITOs may differ from those referred to in section one: this is due to the use of a more up-to-date data extract in the statistical modelling section. For example, 'Commercial Road Transport' became 'Tranzqual' and 'Power Crane' became 'Opportunity'.

Note:
(ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability for a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners). Some of these ITOs no longer exist as stand-alone entities, and may have been merged.

Figure 63 shows the predicted probability of programme completion by the reference category by industry training organisation, controlling for the other factors within the regression model, if they were involved with a different 'ITO'. This variable was the largest predictor of programme completion. In other words, it would make a real difference in terms of programme completion rates, for the reference category of learners, if they were assigned to a different industry training organisation. For some ITOs, the effect is strongly negative, in other words, a learner (in the reference category) will be less likely to complete their programme with one 'ITO' than another; (see table 9, below).

This is not the same thing as defining the predicted probability of completion for all learners exiting a given 'ITO', but it is isolating the effects of each 'ITO' variable, holding all of the other characteristics of the reference category constant. Again, it is important to note that if a different reference category was chosen, the predicted probabilities for each 'ITO' could change. What's important is the relative position of each 'ITO' variable *for this reference category.*

These effects may only be due in part to the Industry Training Organisation itself, but also attributable to currently un-measurable factors, such as industry coverage, tradition of training, industry employment effects.

A similar study of Australian workplace training's probability of completion found wide differences in the predicted probabilities of an apprentice or trainee completing their training contract across occupational groups. The predicted probability of a mechanical and fabrication engineering tradesperson reporting a completion of a training contact in 1998/1999 was 70 per cent while the predicted probability of an elementary clerk reporting a completion was only 33 per cent.[13]

What is clear is that, all other things being equal, there is a wide variation between 'ITO' in contribution to successful outcomes for learners. The general pattern of adjusted probabilities matches the observed probabilities (see figure 55). Where they differ, however, it is probable that controlling for the variables within the model is responsible for the change, as well as the choice of reference category. It should also be remembered that the predicted probabilities are for the reference group of learners, who cannot represent all industry training learners.

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[13] Ball, K., 2004. Conference presentation. *Factors Influencing Completion Of Apprenticeships And Traineeships.* NCVER.

Table 9: Predicted Probability ranking for ITOs

ITO	Predicted Prob.	Prob. Ranking	Sig.	Logit	Odds R.
Joinery	0.86	1	0.00	2.72	15.18
Painting Contractors	0.79	2	0.00	2.25	9.44
Local Government	0.68	3	0.00	1.64	5.18
Leather	0.58	4	0.04	1.24	3.46
Printing and Allied Industries	0.53	5	0.00	1.02	2.77
Flooring	0.52	6	0.00	0.97	2.65
Retail Meat	0.50	7	0.00	0.92	2.52
Master Plumbers, Gasfitters & Drainlayers	0.49	8	0.00	0.89	2.42
Hospitality	0.47	9	0.00	0.78	2.19
Ambulance Education	0.46	10	0.05	0.75	2.12
Community Support Services	0.45	11	0.00	0.70	2.02
Public Sector	0.44	12	0.00	0.68	1.98
Pharmacy	0.39	13	0.16	0.46	1.59
Opportunity (Crane, scaffold, rigging…)	0.37	14	0.01	0.39	1.48
NZITO (Dairy Manu.,Meat process.,Leather)	0.35	15	0.00	0.28	1.32
Motor	0.35	16	0.01	0.27	1.31
Electrotechnology	0.34	17	0.00	0.24	1.27
Sports Fitness	0.31	18	0.28	0.09	1.09
Aviation, Tourism and Travel	0.30	19	0.30	0.06	1.06
Building Service Contractors	0.29	20	0.35	0.03	1.03
Building & Construction	0.29	21	0.36	0.03	1.03
Forest Industry Training (reference category)	0.29	22	N/a	0.00	1.00
Sports Turf	0.28	23	0.37	-0.02	0.98
Competenz	0.25	24	0.02	-0.17	0.84
InfraTrain (Infrastructure)	0.25	25	0.09	-0.21	0.81
Furniture	0.21	26	0.04	-0.42	0.66
Boating Industries	0.19	27	0.01	-0.53	0.59
Tranzqual (Road transport, warehousing &	0.19	28	0.00	-0.53	0.59
Hairdressing	0.19	29	0.00	-0.54	0.58
Social Services	0.17	30	0.00	-0.65	0.52
Equine	0.14	31	0.09	-0.89	0.41
Plastics and Materials Processing	0.14	32	0.00	-0.90	0.41
Apparel and Textile	0.14	33	0.00	-0.91	0.40
Retail Training	0.14	34	0.00	-0.93	0.40
Horticulture	0.13	35	0.00	-1.01	0.36
Seafood	0.13	36	0.00	-1.02	0.36
Fire and Rescue Services	0.12	37	0.00	-1.11	0.33
Extractive Industries	0.09	38	0.00	-1.46	0.23
Electricity Supply	0.08	39	0.00	-1.56	0.21
Agriculture	0.06	40	0.00	-1.92	0.15

5.4.2 Duration

The actual duration of learners in each programme generally had an effect on whether learners completed them: this variable was the second most important predictor in the model. The reference category was 13 to 18 months, and the odds ratios compared to this category are below:

Effect	Logit	Odds r.	Significance
• 0 to 6 months	0.76	2.14	*
• 7 to 12 months	0.22	1.24	*
• 19 to 24 months	-0.23	0.79	*
• 25 to 30 months	-0.38	0.68	*
• 31 to 36 months	-0.19	0.83	*
• 37 or more months	0.00	1.00	

* = significantly different from the reference category at the 5 percent level.

Figure 64: Predicted probability of programme completion by duration on programme
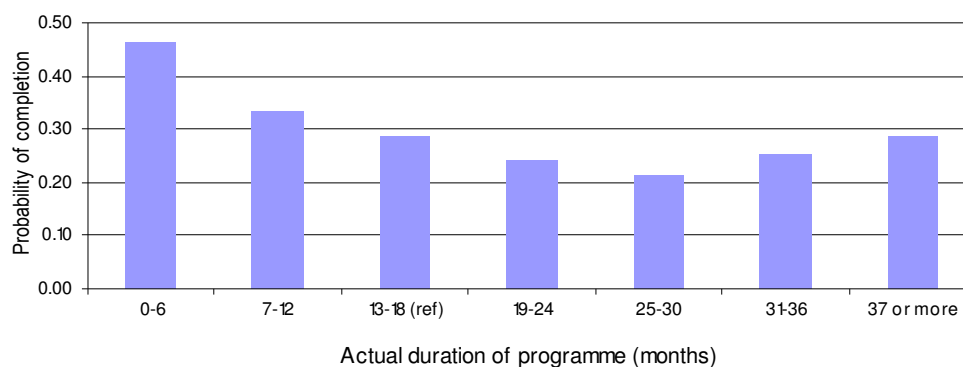
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 64 shows learners exiting from programmes with shorter duration were more likely to complete them than those exiting after 13 to 18 months, while those taking more time generally were less likely to complete their programme than the reference category. Those exiting after 37 or more months were just as likely as the reference category to exit with a completion.

This finding makes intuitive sense: a logical train of thought identifies that short programmes require less effort to complete than longer programmes, which require more effort to complete. It may be that longer programmes provide learners with the skills they require, however, towards the end it is the skills acquired, rather than the credentials, that become important to the learner. It has already been discussed that it is possible that programme completion, in this respect, is not an adequate indicator of success in industry training: skills may be acquired and successfully utilised within the workplace, without the requirement for credentials. In the presence of employment (as is necessary in industry training), credentials become less important than in the absence of it.

It should be remembered that this variable measures actual duration on programmes, and that actual duration may reflect ability to acquire skills at different rates. Industry training learners are able to proceed at their own pace to a certain extent, notwithstanding assessor and employer limitations. It may be that learners who are quicker to attain skills than others are also more likely to

be able to satisfactorily complete all of the tasks required in their assessment. Conversely, learners who are slower to attain skills may take longer to proceed through their programme, and may also be less likely to satisfactorily complete assessment tasks.

This consequence is not a reflection of programme type (NC, LCP, SCP etc) which is controlled for in the model, and the effects of which are examined in later sections, below.

5.4.3 Volume (STMs)

There was an effect across the different iterations of predicted volume of learning for each programme. The reference category was 0.3 to 0.5 STMs.

Effect	Logit	Odds r.	Significance
• 0 to 0.2 STMs	-0.46	0.63	*
• 0.6 STMs	-0.30	1.35	*
• 0.7 STMs	0.16	1.18	*
• 0.8 STMs or higher	0.40	1.49	*

* = significantly different from the reference category at the 5 percent level.

The odds ratios, and figure 65 below, indicate that generally, exits from lower volume programmes of learning are less likely to be completed than those that are predicted to be higher volume.

Figure 65: Predicted probability of programme completion by proposed volume of learning (STM)
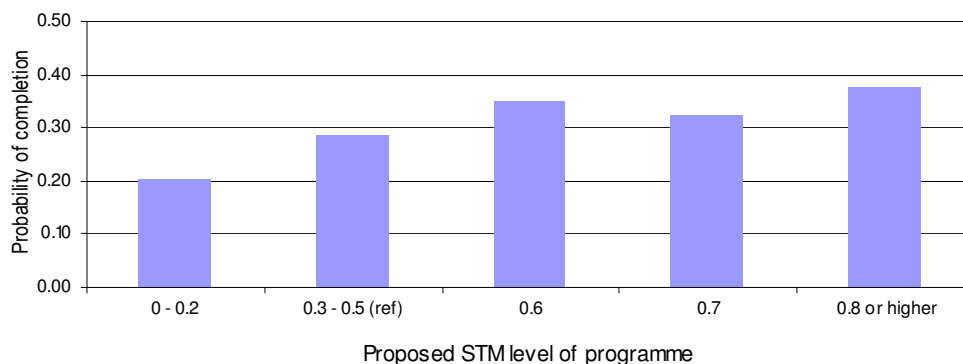
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability for a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 65 shows a complex relationship between proposed volume of learning on programme, and predilection for programme completion. Generally, those learning at a lower volume than the reference category were less likely to complete; those learning at a proposed higher volume (more intensive) were more likely to complete. Learners at 0.7 STMs or higher may be participating *in recognition of prior learning*, rather than *formal learning and assessment* – it seems unlikely that learners could sustain this volume of learning as well as meet their obligations to their full-time employment.

This finding might lead us to speculate that the higher probability of completion for higher STM levels reflects that learners undergoing *recognition of prior learning* are more likely to have the skills for which they are being assessed than those undergoing learning and assessment. However, there may be other, including motivational factors, involved. Recognition of prior learning learners may only participate solely to have their existing skills recognised through certification, and so may be more likely to see their programme right through to the end than learning and assessment learners, who may have other motivations.

5.4.4 National Certificate programme type

As with the observed probabilities, the adjusted probability of programme completion was greater for non-National Certificate programmes: the odds ratio of completion for these was 1.5 times that of National Certificate type programmes, for our reference category of learners (see Figure 66).

Figure 66: Predicted probability of programme completion if programme is National Certificate type
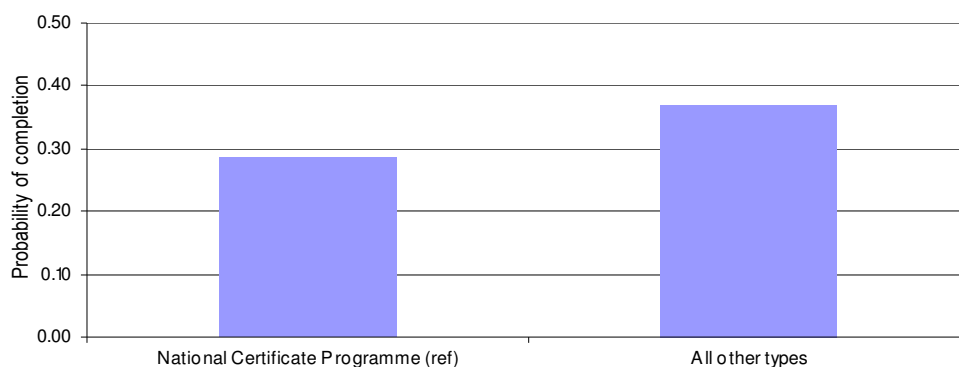
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability for a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The difference in probability of completion between National Certificate programme types, and other types of programme, must be down to something intrinsic within the typology of programme. It is not due to other differences or similarities, such as the duration of learning. It is true that other programme types are invariably of a shorter duration, but this is already controlled for in the model by the duration variable. At present, not enough is known about the differences between these types of programmes to be able to offer an explanation for the difference. We could speculate that, it is more a case of other programme types, such as LCPs and SCPs, being pre-requisites for employment than for the National Certificate programme. For example, they may be more likely to consist of core units required for safe operation within each workplace, such as occupational health and safety units. As such, learners may feel (under instruction from their employers) that completion of LCPs and SCPs is more of a priority for their employment than National Certificate programmes.

5.4.5 Limited Credit Programme type

As with the observed probabilities, the adjusted probability of programme completion was greater for Limited Credit programmes than for other types: the odds ratio of completion for these was 1.47 times that of all other programme types, for our reference category of learners (see Figure 70).

Figure 67: Predicted probability of programme completion by Limited Credit Programme type

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 67 plots the predicted probability of programme completion, by whether the programme is a Limited Credit Programme (LCP) against all other types of programme. It shows that the predicted probability of completion for learners in the reference category exiting LCPs is 37 percent, higher than for other types of programmes.

## 5.4.6 Field of Study

This variable was the sixth most important predictor of programme outcome.

There was an effect across the different iterations of Field of Study for each programme. The reference category was Agriculture, Environmental and Related studies.

Effect	Logit	Odds r.	Significance
• Mixed field programmes	1.28	3.58	*
• Management and Commerce	0.63	1.87	*
• Information Technology	0.43	1.54	
• Engineering and related technologies	0.15	1.16	
• Food, Hospitality and Personal Services	0.05	1.06	
• Society and Culture	-0.15	0.86	
• Creative arts	-0.22	0.80	
• Health	-0.43	0.65	*
• Education	-0.74	0.48	*
• Architecture and Building	-0.91	0.40	*

* = significantly different from the reference category at the 5 percent level.

Figure 68: Predicted probability of programme completion by field of study
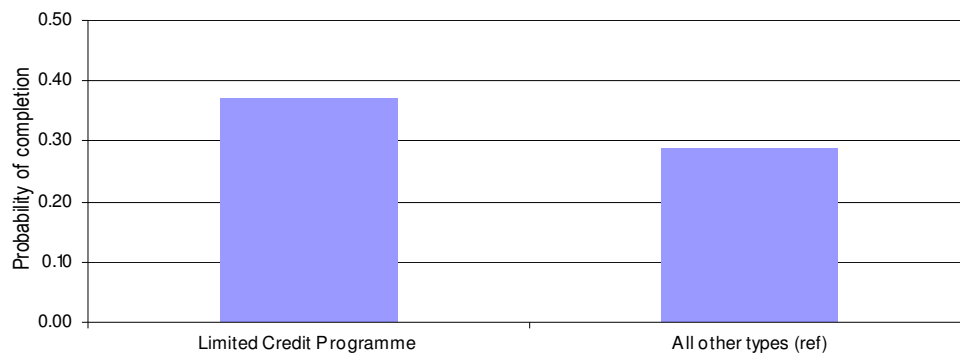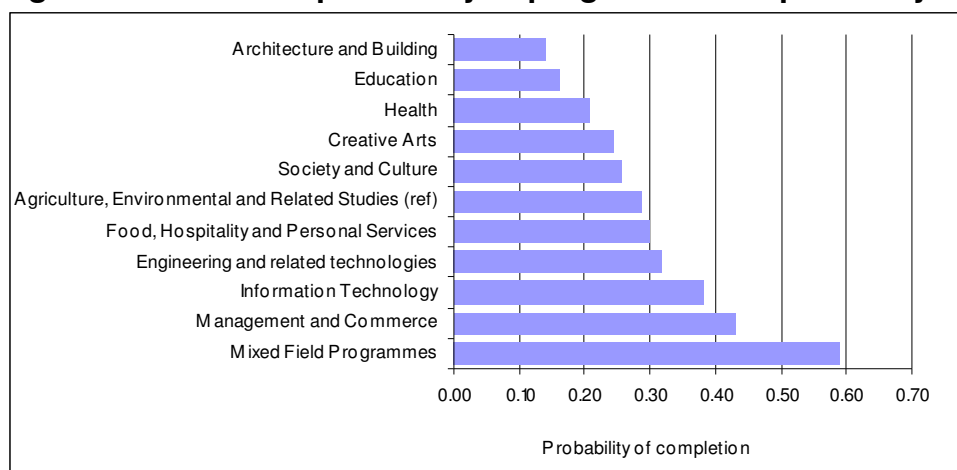

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The 'Natural and Physical Sciences' field of study was excluded from modelling because its small numbers of learners relative to other fields may have caused modelling problems (such as large standard errors, compared to the other fields).

Field of study did make a difference in terms of probability of programme completion. It was entered into the model before ITO in an attempt to isolate field of study effects from the ITO variable. That it accounts for less variance than ITO, shows the strength of the reduced ITO variable. In other words, ITO, employer and industry effects combined are more important predictors of programme completion than field of study alone.

If the reference category of learners were instead studying in the 'Health'; 'Education', or 'Architecture and Building' fields, they would be statistically significantly less likely to complete their programmes compared to the reference category field; if those learners were studying in the 'Mixed field programmes', or 'Management and Commerce' fields, they would be significantly more likely to complete their programme (3.6 times more likely, in the case of the former category).

Table 10: Programme exits by Field of Study

Field	Number of exits	% Total
Agriculture, Environmental and Related Studies	18,767	13.8%
Architecture and Building	7,615	5.6%
Creative Arts	52	0.0%
Education	171	0.1%
Engineering and Related Technologies	40,876	30.2%
Food, Hospitality and Personal Services	23,292	17.2%
Health	4,455	3.3%
Information Technology	131	0.1%
Management and Commerce	22,618	16.7%
Mixed Field Programmes	29	0.0%
Society and Culture	17,552	12.9%
Grand Total	135,558	100.0%

Mixed field studies only account for less than 0.1 percent of programme exits, so the high probability of completing these programmes does not change matters so much. Management and Commerce programmes account for 17 percent of exits; while not the largest category in terms of number of exits, they are the next most likely to be completed, and the only other category statistically more likely to be completed than the reference category.

In summary, the rationale for including 'field of study' in the model was to provide some disaggregation of the 'ITO' variable: our hypothesis being that 'ITO' encompassed a number of different influences, including field of study, employer, industry and organisation (ITO) effects. That 'field of study' ranked as only the sixth largest factor in the model, in the presence of the ITO variable, and that 'ITO' in the presence of 'field of study' is still very important, implies that 'field of study' was a lesser constituent of the 'ITO' variable.

5.4.7 Age at exit

Age was the seventh largest predictor variable. The reference category was 20 to 29 years old at exit from programme.

Effect	Logit	Odds r.	Significance
• 15 to 19 years old	-0.48	0.62	*
• 30 to 39 years old	0.07	1.08	*
• 40 to 49 years old	0.20	1.22	*
• 50 years or older	0.21	1.24	*

* = significantly different from the reference category at the 5 percent level.

** = significantly different from the reference category at the 10 percent level.

The odds ratios show that younger learners were generally less likely to complete their programmes than the reference category, while the older learners were when exiting, the more likely they were to complete their programme. Learners aged 50 years or older were 1.24 times as likely as 20 to 29 year olds to complete their programme at each exit.

Figure 69: Predicted probability of programme completion by age at programme exit
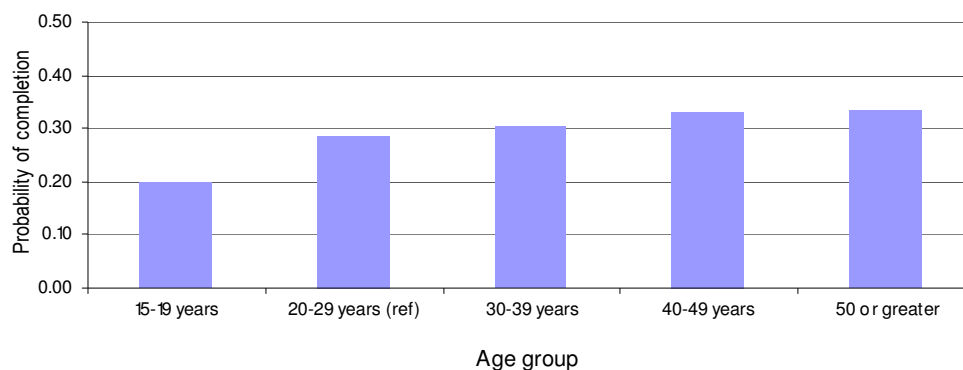
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability for a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 69 shows that there is a propensity to improved likelihood of programme completion, with advancement of age. Fifteen to 19 year olds are statistically significantly less likely to complete than the reference group, 20 to 29 year olds. Thirty to 39 year olds; 40 to 49 year and 50 years or older age groups do differ to that of the reference category — their probability of completion is the highest of all the age groups. This age effect is also evident in Australia: older learners are more likely to complete their programmes than younger learners.

There could be a number of reasons for this finding. Younger learners may be less concerned than older learners with credentialing. However, this is contrary to the generally held belief that older workers would be less concerned about credentialing than younger learners. Older learners have more experience than younger learners, and their curriculum vitae acts as a signal of their acquired skills and capabilities in the labour market. It is this experience that perhaps equips older learners to more readily be able to accomplish tasks, such as completing programmes, than younger learners who are generally less experienced. Younger learners implicitly have more time to make up their minds about a chosen career path; and may try several different vocations before they settle into a career: they may be more likely to 'drop out' before completing than older learners.

5.4.8 National Qualifications Framework Level

NQF level was the eighth most important predictor in the model. The reference category was Level 3 (chosen as it represents the largest single category of exits).

Effect	Logit	Odds r.	Significance
• Levels 1 and 2	0.30	1.35	*
• Level 4	0.45	1.56	*
• Level 5	0.06	1.06	
• Levels 6 and 7	-0.84	0.43	*

* = significantly different from the reference category at the 5 percent level.

There is a complex relationship between predilection for programme completion and NQF Level for this reference group. learners exiting programmes at levels 1 to 2 were 1.35 times more likely to complete them than those exiting programmes at Level 3. Those exiting programmes at Level 4 were 1.56 times more likely than those at Level 3, while learners at Levels 6 and 7 (relatively few) were less likely (0.43 times as likely) to complete.

Figure 70: Predicted probability of programme completion by NQF level of programme
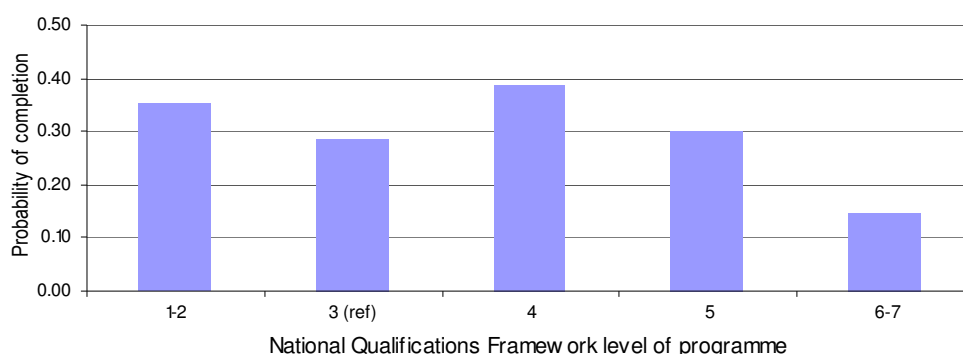
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 70 plots the difference in probability of completion of programme, by the National Qualifications Framework level of the programme. Taking into account that most programmes in industry training occur at Levels 1 to 3, generally, the probability of completion declines as the NQF Level of the programme increases. Only a small proportion enrol in programmes at level 5 or above. In contrast, the probability of completion at Level 3 is significantly lower than that at level 4.

An equivalent Australian study found that apprentices and trainees studying lower-level qualifications (AQF Certificate I or II) were much less likely to complete a training contract than apprentices and trainees studying for a higher-level vocational qualification. The predicted probability of an apprentice or trainee completing a training contract increased as the level of vocational qualification increased.

Any analysis of this effect has to consider the possibility that lower level programmes are more likely to be completed than higher level programmes because they are less taxing for the learner, however, other explanations are worth pursuing. They may also be more relevant to the learners' day to day employment, and may be less theoretically oriented. Level 4 programmes may have more likelihood of completion for a number of reasons, including that only the most able learners pursuer Level 4 learning: this merits further investigation.

5.4.9   Location of employment

This variable was the ninth most important predictor of programme outcome. There were differences in probability of programme completion, depending on the location of employment of the learner. The reference category for this variable was 'Bay of Plenty'.

Effect		Logit	Odds r.	Significance
•	Eastern Coast	0.15	1.16	*
•	Canterbury	0.14	1.15	*
•	Central	0.14	1.15	*
•	Waikato	0.09	1.09	*
•	Southern	0.03	1.03	
•	Nelson/Marlborough/West Coast	-0.03	0.97	
•	Auckland	-0.10	0.91	*
•	Northland	-0.11	0.89	**
•	Wellington	-0.15	0.86	*

* = significantly different from the reference category at the 5 percent level.

** = significantly different from the reference category at the 10 percent level.

Figure 71: Predicted probability of programme completion by location of employment
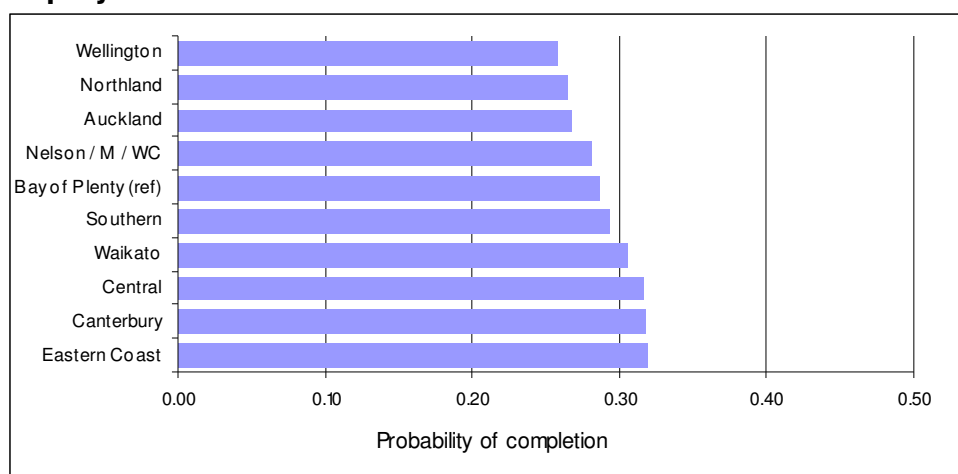
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

It seems that learners whose location of employment was within the Wellington, Northland and Auckland regions were significantly less likely to complete their programme than the reference category learners, while learners in Waikato, Central, Canterbury and Eastern Coast TEC regional office areas were significantly more likely to complete their programme.

It is not entirely clear what this finding represents, apart from the obvious conclusions to be drawn; that where learners' work makes a difference to their predicted probability of programme completion. The spread of odds ratios around 1 is not very wide, however, and the ranking of this effect at ninth in the model indicates that it is not a major driver.

However, it is important to ask what it is about each region that accounts for these differences? This effect is not reliant on industry; nor field of study, as these variables are already controlled for within the model. The ranking of locations appear to indicate population density effect, with learners in the most densely populated regions (Wellington and Auckland regions combined) being the least likely to complete.

A similar Australian study found that there was a significant difference in the likelihood of an apprentice or trainee who lived in a capital city completing their training contract compared to those living in other metropolitan and rural areas. Apprentices and trainees who lived in non-capital city metropolitan areas and rural areas were more likely to complete compared to those living in capital cities and remote or interstate localities. Apprentices and trainees living in rural areas had the highest predicted probability of completing their training contract.

We could speculate that there is an employment selection effect at work here: in rural areas, there may be less choice of alternative employment available to learners, than in highly populous areas. Learners in big cities may have more alternative employment options than in less populous areas. There may also be a 'small town' monopolistic industry coverage by one employer – if you work in a certain industry, in a certain rural town, then there may only be one employer to work for. We could also speculate that workers in the big cities might be able to access more information about career choices and employment opportunities than those in more rural areas (although, with the advent of the internet, this effect may fade in time as rural employers embrace internet job advertising in greater numbers).

There is probably more to it than this, however: New Zealand is a geographically diverse country, and each region may have it's own industries, employers and apprenticeship traditions feeding into this phenomenon. Further investigative study is required: due to availability of data at various dates, this paper has not investigated geographic location of learners, so there is as yet no statistical context to apply.

5.5.0 Previous highest qualification

This variable was the tenth most important predictor of programme outcome. The reference category for this variable was 'No previous qualifications' and the odds ratios are calculated for each category in comparison to this.

Effect	Logit	Odds r.	Significance
• 6th Form or equiv.	0.13	1.13	*
• 7th Form or equiv.	0.11	1.12	*
• 5th Form or equiv	0.06	1.07	*
• Sub degree	0.06	1.07	
• Not specified	-0.09	0.91	*
• Degree	-0.13	0.88	

* = significantly different from the reference category at the 5 percent level.

The odds ratios indicate that all categories, apart from sub degree and degree, are statistically significantly different to the reference category in likelihood to complete their programme. Learners who attained 6th form or equivalent level qualifications less were 1.13 times more likely than those who attained no previous qualifications in terms of probability of completion of programme. Degree-

level learners were the only category who were statistically significantly less likely to complete their programme than the 'no previous qualifications' group.

Figure 72: Predicted probability of programme completion by previous highest qualification
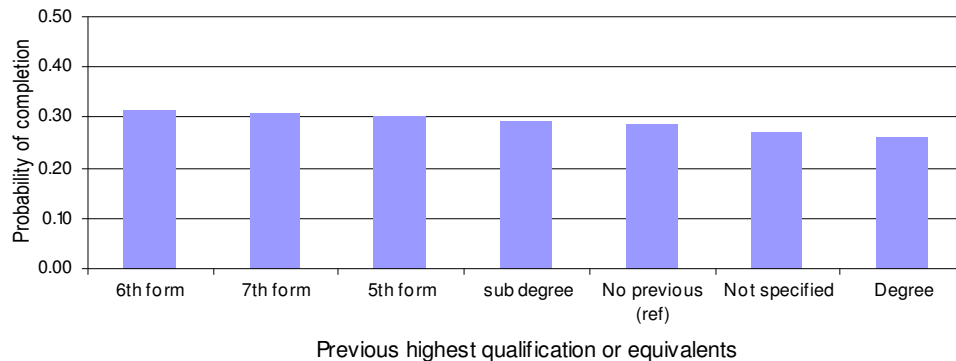
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 72 appears to show little difference between the qualification categories, when all other variables within the model are accounted for. Statistically, only those learners who indicated their previous highest qualification was at the level of 5th to 7th form or equivalent were more likely to complete their programme than those learners in the reference category. Only learners who indicated a degree as their previous highest qualification were statistically less likely than the reference category to complete their programme. None of the other categories reached the threshold for statistical significance (5 percent).

We could speculate that motivation to become certified may be the driving factor here: learners with higher qualifications such as university degrees may be less concerned with completing their programme and attaining an associated national qualification because they have a degree already. However, more investigation is required to provide definitive answers. Linking performance data to learners' NZQA record of learning, for instance, would enable a more reliable assessment of the association (if any) of previous qualifications with success in industry training to be made.

5.5.1 Ethnic group

Ethnic group was the eleventh most important predictor in the model. The reference category was 'European' learners.

Effect	Logit	Odds r.	Significance
• Māori	-0.13	0.88	*
• Pasifika	-0.07	0.93	**
• Not stated	0.05	1.06	
• Other	0.02	1.02	

* = significantly different from the reference category at the 5 percent level.

** = significantly different from the reference category at the 10 percent level.

'Not stated' and 'Other' learners were the only ethnic groups who were as likely as European learners to complete their programme. When holding all of the factors in the model constant, Māori and Pasifika learners were less likely to complete their programme than European learners.

Figure 73: Predicted probability of programme completion by ethnic group
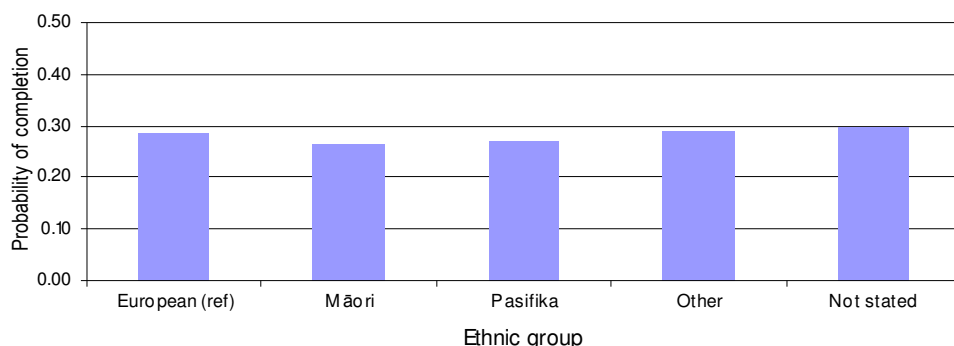
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The ethnic group effect is not large, and the range of odds ratios is not wide, however, it is concerning that there is a difference between European, and Māori and Pasifika learners, warranting further investigation.

5.5.2 Exit year

This variable was the twelfth most important predictor of programme outcome. By accounting for the passage of time, it is possible to assess whether the probability of completion is changing due to otherwise intangible and un-measurable factors, such as provider experience; administrative change (such as improving data submission and collection techniques); and employer exposure to industry training, for instance. Of course, without further investigation, it is impossible to allocate effects definitively to any one of these factors.

Figure 74: Predicted probability of programme completion by year of exit

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).
* category statistically different to reference category at the 5 percent level.

Figure 49 showed the observed probability of programme completion increasing with each successive year. However, according to this model, only programme exits that occurred within 2007 were statistically significantly different to the reference category (2006). There doesn't seem to be trend to improved probability of completion in the adjusted observations: the effect is less stark than for the observed values, indicating that other variables may be having an effect as well, and/or the reference category is not entirely representative of all industry training learners.

If we assign improvement in probability of programme completion across years to administrative improvement, provider and employer exposure and receptiveness etc, we would not be able to argue convincingly that this was occurring wholesale. It may be that controlling for the common reference category attributes, particularly those encompassed by the 'ITO' variable, shows things have not changed much across the years.

5.5.3 Off-job component

This variable was the thirteenth most important predictor of programme outcome. It is a new variable: due to timing of availability of data, it has not been analysed within the first section of this paper. It is an experimental variable, based on the match of TEC programme data to NZQA qualifications data, and the Single Data Return (SDR).

If a programme appears within the SDR, it signifies that some provision occurs 'off-job' within a TEI, such as a Polytechnic, as opposed to being delivered completely within the workplace. Again, due to timing and availability of data, this variable is not contextualised within section 1, so care should be taken with interpretation of this variable.

Figure 75: Predicted probability of programme completion by off-job component variable

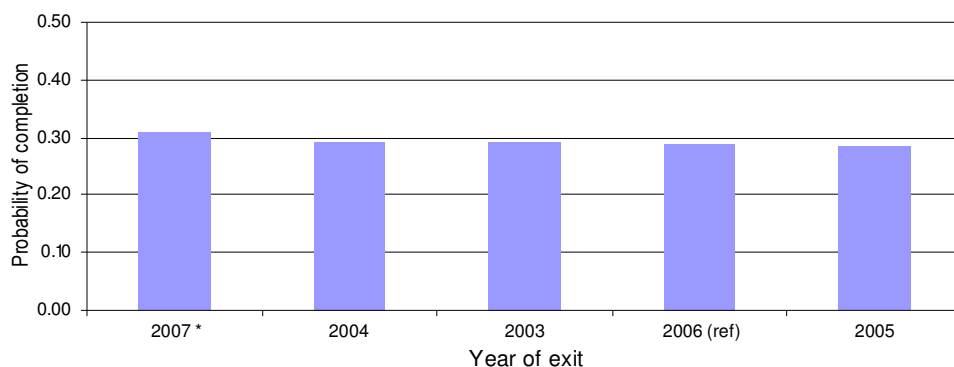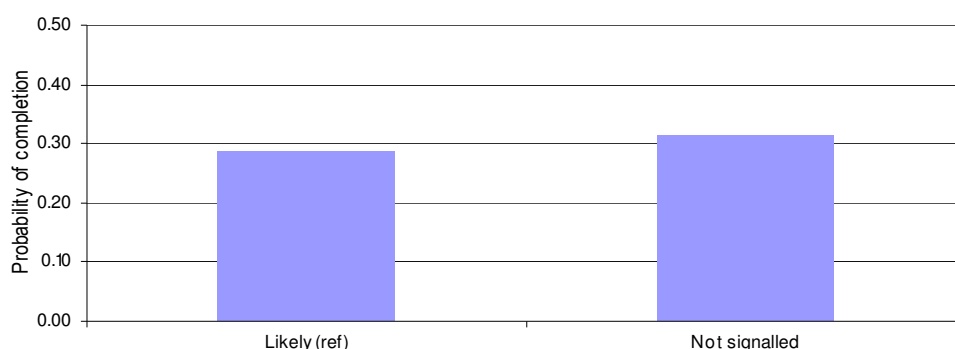Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability for a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The difference in the levels of the variable appear to indicate that learners who participate in work-place based learning only, with no off-job component, such as a block component at an ITP[14] tend to be slightly more likely to complete their programme (1.13 times as likely). More investigation of this is required before any conclusions can be drawn.

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[14] ITP is a Polytechnic or Institute of Technology.

5.5.4 Learner category

This variable was the fourteenth most important predictor of programme outcome. Each learner is assigned a categorisation by their ITO, based on TEC's administrative specifications. It is not entirely clear what each category signifies, as definitions of each are not been provided in supporting documentation. For example, it is not known if 'State Sector' and any of the other categories are mutually exclusive, or how any of the categories are allocated. It follows that how much attention should be paid to this variable on the basis of consistency and logic is probably a moot point. However, the variable names may provide some clues as to each learners' status.

Figure 76: Predicted probability of programme completion by learner category
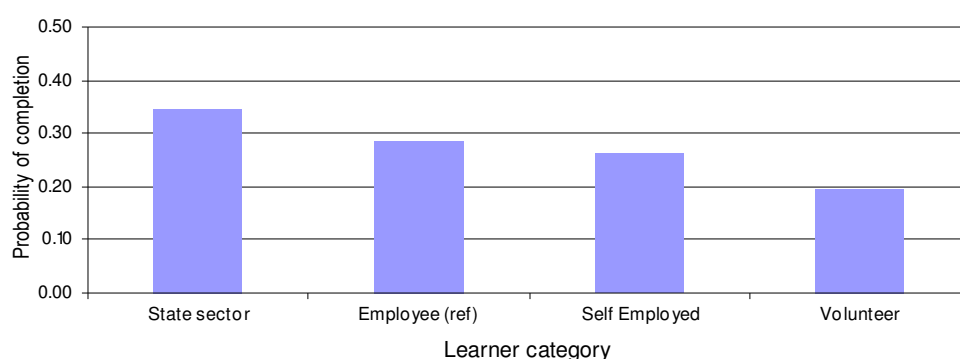
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The model indicates that 'Volunteer' learners are the only category (statistically significantly) less likely to complete their programmes than the reference category. This is an interesting finding: we could speculate that, because there is no remuneration associated with the work, volunteers are more likely to regard credentialing as the purpose of participating in workplace learning than other categories of learner, such as employees. However, this appears not to be the case. It may be that the requisite skills are acquired at the same rate for volunteers as for other learners, but credentialing may be less important for this demographic than for others.

The Australian study found that apprentices and trainees employed in the government sector were more likely to complete an apprenticeship or traineeship than apprentices and trainees employed in the private sector or by group training companies.

5.5.5 Training Fund

Fund is the fifteenth most important predictor, and there is a difference between industry training and Modern Apprenticeships (industry training was the reference category).

Effect	Logit	Odds r.	Significance
• Modern Apprenticeships	0.11	1.12	*

* = significantly different from the reference category at the 5 percent level.

This gives an indication of the effects due to the presence of 'Modern Apprenticeships'. In other words, the regression provides a prediction for the following scenario: If the learners in the reference category had been involved in Modern Apprenticeships instead of industry training, they would have been slightly more likely (1.12) to complete their programme than those exiting industry training programmes.

Figure 77: Predicted probability of programme completion by fund
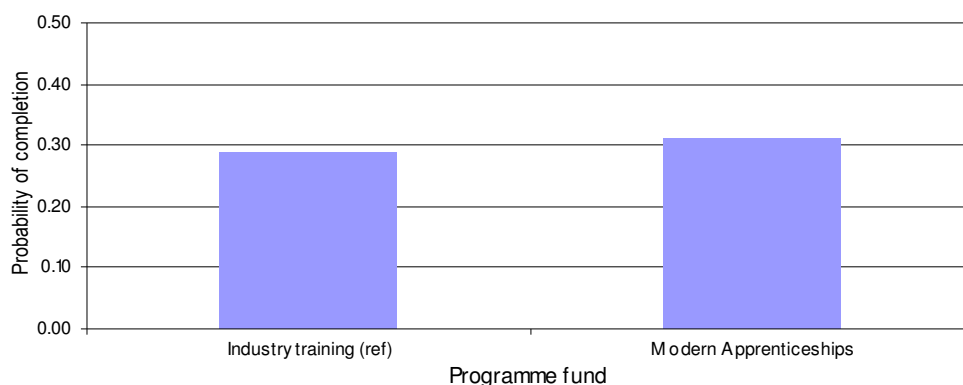
Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

The higher probability of completion for the reference category cannot be attributed to the other variables in the model, such as the age of the learner. As age of learner already appears elsewhere in the formula, the effects of age are held steady, or controlled for. Therefore there must be other factors driving the difference between the two funds, although the difference is not large. This effect must be investigated further: the Ministry intends to conduct further studies on Modern Apprenticeships as more data becomes available.

5.5.6 National Diploma Programme type

As with the observed probabilities, the adjusted probability of programme completion was lower for National Diploma programmes than for other types: the odds ratio of completion for these was 0.7 times that of all other programme types, for our reference category of learners (see Figure 78).

Figure 78: Predicted probability of programme completion by National Diploma Programme Type

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

Figure 78 plots the predicted probability of programme completion, by whether the programme is a National Diploma Programme (ND) against all other types of programme. It shows that the predicted probability of completion for learners in the reference category exiting NDs is only 21 percent; lower than for other types of programmes.

As with the differences between National Certificates and other programme types (LCPs and SCPs), duration of learning on the programme is not responsible for this effect, as this is controlled for in the model. NDs account for a very small proportion of the programme types (in terms of participation), which is probably why this effect only ranks sixteenth in the model.

5.5.7 Gender

Gender of learner was the seventeenth most important predictor variable in the model. The reference category was 'Male'. The odds ratio for females over males indicates that females were slightly more likely than males to complete their programme (1.05 times as likely).

Figure 79: Predicted probability of programme completion by gender
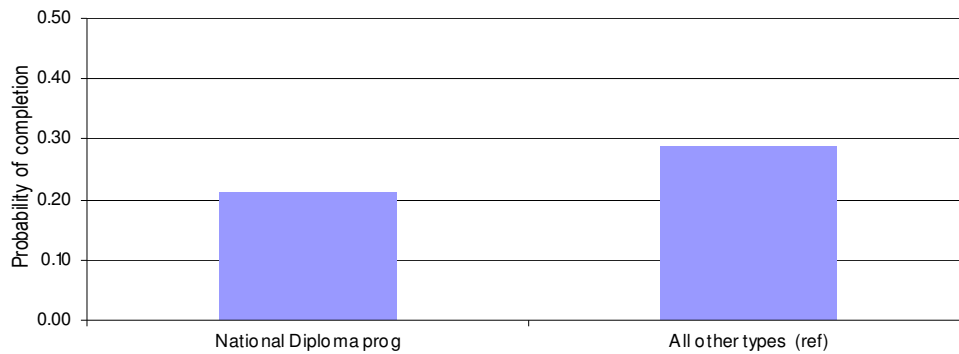

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).

This, again, is encouraging, given that the proportion of industry trainees who are women is low. It may also reflect the wider proclivity of women to complete qualifications in other forms of education at the same or higher rates than men. Further study should include comparing the programme completion rates between men and women between the various industries that women are more likely to be clustered within, to identify where programme completion rates for women are higher than, or lower than, for men.

5.5.8 Supplementary Credit Programme type

As with the observed probabilities, the adjusted probability of programme completion was greater for Supplementary Credit programmes than for other types: the odds ratio for completion of these was 3.7 times that for all other programme types, for our reference category of learners (see Figure 80).

Figure 80: Predicted probability of programme completion by Supplementary Credit Programme type

Source: Tertiary Education Commission
Note: (ref) identifies the reference category in the logistic regression equation. The figure identifies the predicted probability of a change in the level of this variable, holding all other reference categories constant, for the reference category of learners (*not* all industry training learners).
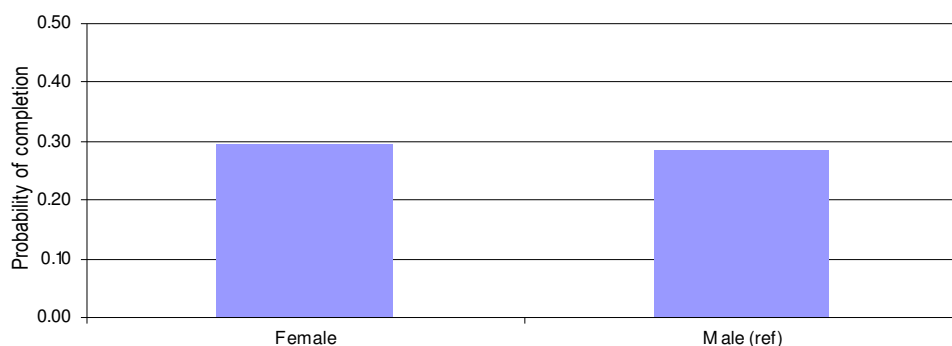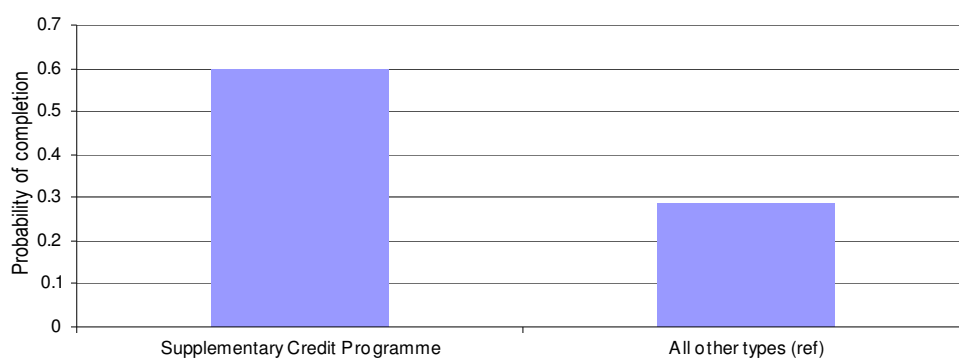
Figure 80 plots the predicted probability of programme completion, by whether the programme is a Supplementary Credit Programme (SCP) against all other types of programme. It shows that the predicted probability of completion for learners in the reference category exiting SCPs is 60 percent, higher than for other types of programmes.

As with the differences between National Certificates and other programme types (LCPs and NDs), duration of learning on the programme is not responsible for this effect, as this is controlled for in the model. SCPs are generally taken after National Certificates are completed: they provide the opportunity for additional skills accumulation. As this is the case, there may be a selection effect at work here – learners who have already completed an NC may therefore already have the attributes required to complete an SCP, so are more likely to do so.

SCPs account for a very small proportion of the programme types (in terms of participation), and they are a relatively new addition to the cadre of programme types, which is probably why this effect ranks only eighteenth in the model. It is likely that SCPs will be become more widely used within industry training in future.

6.   Conclusions

This paper attempts to correct the imbalance between what is known about provider-based post-school education and industry training, signifying a first step in the process of gaining a wider understanding of industry training. As workplace learning increases in size, becoming a much larger component of New Zealand's tertiary education sector, we need to deepen our analysis of industry training.

Industry training is unique within New Zealand's tertiary education system. For example, it has its own funding regime: industry training is part-funded by industry as well as by the government. It is industry training for industry, as well as for employees — it reflects a fair share of industry's priorities, as well as government's and learner's. It operates mostly within the workplace unlike other forms of post-school education: meaning that an industry training learner's primary activity is their 'day job', and their learning is always a secondary priority to their work. Perhaps it is because of these differences, and the only recent development of unit record data collections, that generally very little is widely known and understood about how industry training works.

We need to know whether industry training learners achieve at the same or different rates as provider-based learners, for the sake of improving *both* types of learning. A barrier to taking a blanket approach to measure all post-school education success is the different structure, emphases and interests at work in industry training, when compared to provider-based learning. We do know that in provider-based learning, part-timers are less likely to complete their studies than full-time learners. There has been a lot of speculation that industry training learners perform at lower levels than other types of provider-based tertiary education. Thanks to this analysis, we now know that the probability of completion in industry training is roughly the same as the probability of completion by students in provider-based learning in equivalent type programmes.

As mentioned, industry training is part funded by employers, and as such, reflects industry's priorities to a certain extent, as well as government's. This may affect the definition of successful learning, and some indicators may be more sensitive to this priority than others. From an employer's perspective, programme completion may not be as relevant, or important, as skills acquisition, which cannot be measured as easily.

Employees in industries where the credentials are not a mandatory requirement for employment or advancement may have weaker incentives to complete their programme. In these industries, employees may be able to advance on the basis of the growth in their skills obtained by experience alone. Some industries/employers may prefer that learners engage in limited credit programmes, that mostly do not lead to further credentialing, such as national qualifications. Credentialing through credit and national qualification attainment is one way to measure skill acquisition, but this may not be a priority for employers, who might only be interested in how training relates to their business priorities. As learners attain skills reflected in incremental increases in unit standard attainment, they may still be able to add additional value to their workplace, despite never attaining a qualification.

The analysis occurs within the context of a limited administrative dataset, used primarily for funding purposes, and perhaps not well suited to analytical purposes, as well as these questions about the most appropriate indicators. Consequently, there may be some issues with data quality. For example, it is thought that the completion data within the industry training dataset is an undercount, due to the possibility of various events occurring, such as a change of job by the learner, or the enterprise ceasing to trade, preventing the recording of the final outcome of learning when there would otherwise have been one.

However, by taking possible poor data quality issues into account by using appropriate statistical methodologies (and proceeding cautiously), it has been possible to discern key patterns and trends.

This has allowed us to examine factors associated with a measure that we believe, fairly defines success, and conversely; failure in industry training. The decision to use programme completion as the indicator of success was made for simplicity's sake, and does not confine future studies in the selection of success criteria.

Before any statistical modelling could be performed, it was necessary to examine the data to determine key trends, over and above what is already public knowledge, and to give essential context. This analysis has provided interesting insight into the different experiences of various groups of learners participating in industry training.

Qualitative analyses have identified some key issues and have asserted causes and solutions to problems of engagement and completion in industry training in New Zealand, while research based on similar overseas vocational education systems may provide some clues to the identification of the main drivers of success within this country.

The data examination provided interesting information on the type, duration, and ITO grouping of learning by various demographic groups. It shows that industry training participation is diverse; and widely dispersed for the dominant group: European/Pakeha males. Participation by other groups, such as women, Māori, younger and older learners is more stratified within certain industry areas. Achievement is similarly differentiated between the demographic groups.

Programme completion rates are often used as proxy measures for success of these types of programmes. This study found that the 5 year completion rate per learner was 35 percent, and the probability a programme would culminate in a 'completion' was 33 percent. These rates compare favourably with equivalent types of learning in New Zealand, and in other countries. For example 'Framework' completion rates for industry training in England ranged between 27 and 40 percent (on average) between 2003 and 2005. Australian rates generally sit at around 45 percent, on average.

Other measures could be equally as important, such as average credit attainment per learner (53). The modular nature of industry training, based on the attainment of credits through unit standards, means that even if learners do not complete their programme, or a national certificate, they still gain skills that can be used within their workplace: skills that have been measured and attributed to them, that can be taken to and used in other forms of employment and learning.

It's important in this type of analysis to isolate the contribution of each variable while controlling for others: this can be achieved through statistical modelling. At first glance, it seems that ITO (encompassing possibly ITO, employer and industry effects – still a relatively large and unhelpful grouping) is the most important factor associated with programme completion. It has not been possible to separately model industry effects, which is perhaps a major shortfall, given Industry Training Federation's overseas literature review findings that turbulence within industry and training tradition of industry limit the success of workplace learning.

While taking all possible learner attributes into account, it is clear that there is significant variation between ITO coverage: learners with different career aspirations are not presented with an even playing field in respect to probability of completing their programmes. This supports the ITF's qualitative research findings that learner success may in part be due to the employers within ITO coverage industries' attitudes and behaviours regarding workplace learning. It may also, in part, be due to economic ebbs and flows within the coverage industries, and to any influence the ITOs themselves may have. It is not currently possible to tell which factor has the greatest influence within the ITO variable. The contention that educational background of enterprise owner has an effect could never be addressed by a study of this kind. What is clear is that 'field of study' doesn't account for all, or even most, of this variation.

Different levels of the 'field of study' are more likely to be associated with programme completion than others. 'Mixed-field' programmes are the most likely to be completed, followed by 'Management and Commerce'. Mixed-field programmes represent a very small proportion of the sampled data, so wild conclusions about industry training should perhaps not be drawn for them. Further analysis (aside from the modelling) has not been conducted at this stage but it may be that these fields attract higher rates of completion in provider-based learning than in others, or it may be that just within the context of industry training, they may differ. In provider-based learning, it tends to be the vocationally-based fields, such as health and education, that draw the highest probability of completion. Learners study in these fields, because they want to work within them, and they stick to their chosen vocation. These fields are less well-represented in industry training, which may go some way to explaining the difference in their relative importance for predicting completion.

Other significant factors include volume and duration of learning, and NQF level and whether or not the programme is meant to lead to a National Certificate. There could be a number of motivational factors contributing to this latter finding: reflecting the different mix of priorities for each learner and employer in respect of credentialing between national certificate programmes and all other types of programme.

Low volume programmes are less likely to be completed than higher volume programmes. In provider-based learning, learners with higher EFTS rating are generally more likely to complete their studies than those with lower EFTS. In the case of provider-based learning, this may be because learners are involved in other activities such as part-time work which may displace their learning to a certain extent. The complication in industry training is that all learners are employees first, and are learners second – so it seems counter-intuitive that the higher volume learners would be more likely to complete than lower volume learners. There must be something that separates the two types of learning: it may be that higher volume learners are participating in *recognition of prior learning* rather than learning and assessment activity. Recognition of prior learning is funded at the same rate as learning and assessment learning (so it is not differentiated in the dataset for funding purposes from learning activity), but may be able to be taken at higher volumes as the learning stage is entirely absent. It is impossible at this stage to determine the extent of recognition of prior learning activity within industry training, future data collections may develop some signal indicators to enable further analysis of this hypothesis to be conducted.

Programmes at lower levels of the National Qualifications Framework, all other things being equal, are more likely to be completed that those at higher levels. This is perhaps not so mysterious, as higher-level programmes should present more challenge to the average learner than lower-level programmes.

That short programmes are more likely to be completed than longer programmes (to a point) may also reflect the nature of the learner/employer motivation. A number of speculative explanations may fit: the learners most likely to complete their programme are more likely to do so taking a shorter time than those who take longer due to the former's enhanced ability to learn and pick up skills quickly; those who take longer may do so because they are less quick to pick up skills, or may be interrupted in their learning by employer/enterprise priorities (a large order needs to be filled, which displaces the time and effort that would otherwise be expended on workplace learning).

It may be that learners loose motivation in longer programmes: they may drop out before they complete them, or they may gain most of the requisite skills, and since they are already employed, and perhaps are using the skills they have learnt, may not see the need for any more learning just to complete their programme (and gain their credential). Their employer may see their progress as satisfactory for their purpose, and subsequently re-prioritise workflows. Since they already employ the learner, they may have little interest in seeing them become further credentialed, since they know their skills already. In fact, credentialing may make learners more attractive to competitor employers: there may be a fear of poaching or 'training up for the competition' if learners gain

certificates, making it easier for them to signal their skills to the labour market and hence more able to change employers.

The model findings support the anecdotal evidence that non-completion tends to be associated with age: younger learners are less likely than older learners to complete their programmes. The anecdotal evidence that young learners take time to finalise their career choice, trying a few different vocations before settling: this explanation is partly supported by the data. The contention that non-completion is mainly an issue for industries with large numbers of young persons seems logical (i.e. Hospitality), and is mostly supported by the observed data, but the statistical modelling shows that, at least for some industries, it is the industry (ITO) that is the most important factor, and learner age is less so.

This suggests: that younger learners tending to cluster in certain industries is more a consequence of the type of work available to them, which they may prefer to take due to their individual requirements at the time and circumstances, rather than their being for 'younger' people (people of any age may be attracted to them for the very same reasons). Entry into employment in these industries may require relatively smaller skill sets; and may not always be taken up for or regarded as leading to a 'career', but rather shorter-term employment. However, industry training *does* occur within them, illustrating that once there both employers and employees see skills acquisition as important.

Location of employment is a relatively small, but significant, factor associated with industry training success in New Zealand, as identified in international literature. Highly metropolitan areas (such as the Auckland and Wellington regions) are associated with a lower probability of success than other, less populous areas. This effect has been observed in studies of vocational training conducted overseas, but it is not yet clear why this would occur in New Zealand. What seems to be clear is that it should not be related to any form of industry effect, as this is controlled for through the ITO variable.

When all other factors in the model are controlled for, learner factors such as ethnic group and gender are less important. However, it is clear that Māori and Pasifika learners do not have as much success as European learners. Examination of other measures of success, such as average credit attainment per learner, also shows that Māori and Pasifika learners do less well, and tend to study at lower levels on the National Qualifications Framework than European learners.

While perhaps not providing definitive answers, this data analysis and experimental modelling does present a benchmark for future investigation into industry training, as well as a basis for assessing the quality of the data collection. Notwithstanding some problem areas, our assessment is that the data collection is good enough to perform robust statistical tests, and should be used to conduct further research, as is our intention.

 As the public contribution to industry training increases with its overall volume, there is now a need more than ever to ensure that policy decisions for industry training are made on the basis of empirical evidence. Waiting until more reliable data collections are instigated is perhaps advisable, but may ultimately be much more costly. The public stake and associated interest in industry training rises with the level of expenditure of taxpayer funds. Accountability for and determination of the efficiency of this expenditure requires that this investigative work begin sooner rather than later.

Future investigations will explore key themes in more detail, building on the foundations laid in this report. The next logical course of investigation is, *what determines qualification and credit attainment in industry training?* Future projects will examine credentialing in industry training, to attempt to triangulate the various measures of success.

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Appendix - Credit attainment – alternative methodologies

Another way would be to exclude all exits from the equation who achieved zero credits. This way, a measure of the average credit achievement for exits bearing credits can be obtained. By excluding all those who either achieved no credits, or whose credit attainment was not reported to the TEC for funding purposes an effects of the under-reporting of credit achievement on the average achievement level can be negated, with some loss of precision. One purpose of this is the elimination of early exits from the equation i.e. those learners who start but drop out straight away (for whatever reason).

The third way could be to divide the total number of credits achieved on programmes that are exited in the period, for all distinct learners. This adjusts the unit of analysis from learners on programmes to learners. However, it does not provide an aggregate average achievement for learners: just an average for those who left a programme during 2001 to 2006, for their activity in this period.

Sixty one percent of programme exits during the period involved some form of credit attainment (the sum of credits attained was not zero):

Programme exits: 345,260
Programme exits bearing credits: 212,326 (61 percent)

Overall, for all learners who left a programme between 2001 and 2006, average credit achievement was 35.41 credits. For those exits bearing credit (excluding the exits with no credits attached), the average achievement was 57.28. The average credit achievement per learner, obtained by dividing the total sum of credits attained by programme exits by the total number of distinct learners exiting programmes was 52.69.

Average credit achievement credit bearing: 57.58
Average credit achievement distinct learners: 52.69

Figure 81: Programme exits achieving credits by average number of credits achieved at each level and ethnic group (2001-2006)
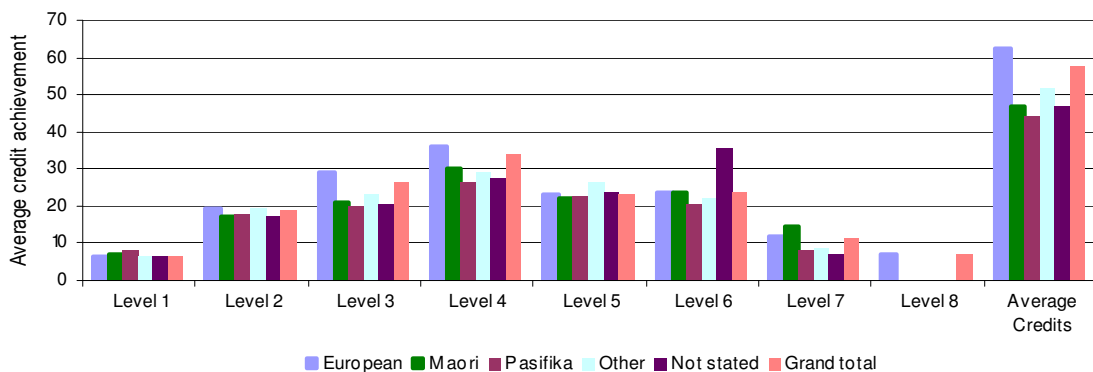
Source: Tertiary Education Commission

Figure 81 shows that, when allowing for possible non-submission of credit information, and the elimination of learners who achieve no credits on their programme, there is a more even

distribution of credit achievement by NQF level. Average credit achievement is higher because the denominator has reduced from 345,260 exits to 212,326 exits (those bearing one or more credits). Average credit attainment under this regime is 62.4 for European learners, 47 for Māori and 44.2 for Pasifika learners (57.6 for all learners)

This evening-out across ethnic groups could also be due to the extraction of exits with no credits from the denominator. To assess the effect of non-achievement (due to either non-reporting or non-attainment) it is helpful to determine if certain ethnic groups may be represented more in the group who exit with no credits than in the group who exit with credits.

## Table 11: Proportions of exits by credit bearing and ethnic group

Ethnic group	Exits with credit	Exits without credit	All exits
European	67.6%	65.2%	66.7%
Māori	17.4%	18.9%	18.0%
Pasifika	4.9%	5.5%	5.1%
Other	6.2%	6.7%	6.4%
Not stated	3.8%	3.6%	3.8%

Table 11 shows that Māori are more highly represented in the group of exits attaining zero credits than in the credit bearing group (and the all exit group), as are Pasifika learners. European learners are more highly represented in the credit bearing group than in the zero credit group.

There are three possibilities that could explain these differences, but that we are unable to assess due to a lack of information:

- Māori and Pasifika learners are more likely than European learners to attain zero credits on programmes
- Māori and Pasifika learners are more likely than European learners to be enrolled with providers who do not report all credits attained, for whatever reason
- a combination of these two reasons.

Figure 82: Programme exits achieving credits by average credits achieved year of exit and ethnic group
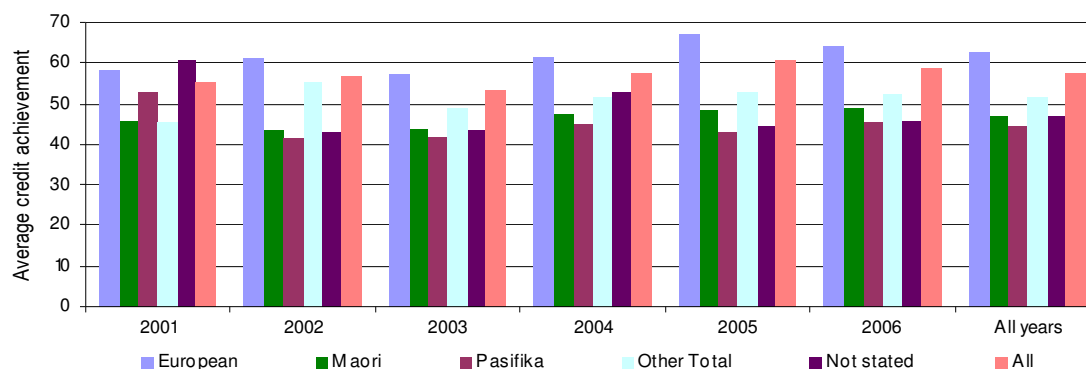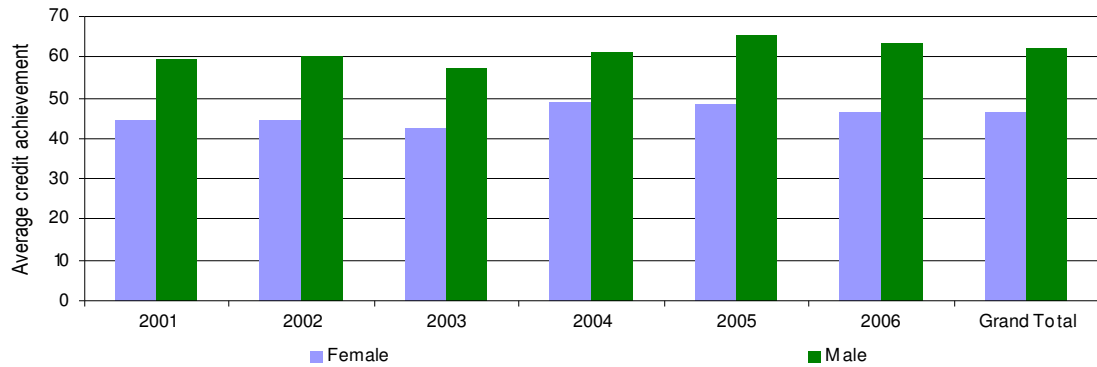

Source: Tertiary Education Commission

Figure 82 shows that the trend of European learners exiting programmes with credits earning on average more credits than Māori or Pasifika learners is consistent across all the years of the period

of interest of this study. The difference between European learners and Māori and Pasifika learners is 10 credits on average across the period.

Figure 83: Programme exits achieving credits by average credits achieved year of exit and gender

Source: Tertiary Education Commission

Figure 83 shows that, excluding trainees who exit with zero credits, women consistently exit programmes with fewer credits on average than men. This difference averages to 15.9 credits, across the whole period of interest.

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