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# **Attrition and New Entry Pathways: Factors Contributing Toward Attrition for Students Entering an Australian University through New VET Entry Pathways**

This thesis is submitted in fulfilment of the requirements for the degree of  
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by

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## Abstract

In response to the review of Australian higher education (Bradley, Noonan, Nugent, & Scales, 2008), several Australian universities have established entry pathways with the Vocational Education and Training (VET) sector as a way of providing access for students from disadvantaged backgrounds. The university in this investigation is one such case where around 200 individual VET pathways have been developed.

This study assesses the effect of a number of factors including previously untested factors, namely, program peer group sizes and various student network sizes associated with these new entry pathways on student attrition and retention at an Australian selective university. Secondary quantitative data from university and admission centre records and primary quantitative data from a structured survey are collected for 140 VET pathway entrants. Semi-structured interviews with 10 of the VET entrants provide additional qualitative data for the investigation. The quantitative analysis considers several multivariate and multilevel path models to examine the effects on student attrition and retention of variables obtained from both secondary and primary quantitative data collections. A qualitative thematic analysis of the interview transcripts is used to support the quantitative findings and to provide additional nuanced information on the issue. The results further an understanding of why students in non-traditional entry pathways drop out of, or conversely, remain at university. In particular, the number of VET peers in a program is shown to moderate the effects of academic performance and social integration on student attrition and retention. Student network sizes are also important in influencing student attrition by means of indirect effects operating through various mediating variables.

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Alessandro Lovat

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# 1 Investigating Equity and Attrition in Tertiary Education

## 1.1 Introductory background

This study takes place in one of the oldest universities in Australia. The university was established in the mid 19<sup>th</sup> century, in the capital city of a State in Australia. As such, it has long been part of the Australian tertiary education system. This chapter begins with an overview of the system with particular emphasis on the State in question. This is followed by an introduction to the topic of 'VET entry pathways to university' and reasons for their establishment in Australia and in international contexts. In addition, the problem statement and research questions are discussed and followed by an explanation of the significance of this study. Finally, the limitations of the data used in this study are discussed.

### 1.1.1 The Australian tertiary education system

The Australian tertiary education system is broadly divided into two sectors: the Vocational Education and Training (VET) sector made up of colleges, or registered training organisations (RTO's), qualified to deliver Certificate and Diploma level VET courses; and the Higher Education (HE) sector made up of institutions accredited to teach Bachelor and post graduate degrees (Australian Qualifications Frameworks Council, 2013; Karmel, 2008). While both sectors now include a large number of small institutions, the majority of students are enrolled at large public funded institutions. The VET sector is dominated by around 60 larger government-run Technical and Further Education (TAFE) institutes and the HE sector by around 40 large publicly funded universities (Karmel, 2008).

In 2010 when many of the participants of this study began their studies, the two sectors had relatively similar sizes nationally. Over that year, VET colleges enrolled 1.8 million students, 1.3 million of whom were enrolled in TAFE institutes (NCVER, 2014) and the HE universities enrolled around 1.2 million students, with around one million in public universities. Many VET students were part-time or completed their VET courses in under a year, whereas a large proportion of the HE students were full time and enrolled for the whole year. In order to compare between sectors the index of 'equivalent full-time students' (EFTS) is often used. For this measure in 2010, the HE



sector recorded around 862,000 EFTS as opposed to 656,000 for the VET sector (NCVER, 2012). These sector figures for 2010 included a large number (6% for VET and 29% for HE) of full-fee paying international students (NCVER, 2012). As this investigation is concerned with VET to HE pathway students, it is necessary to recognize that a large section of the overall HE student numbers included students who had previously studied at a VET college. In 2010, 16,700 (7.0%) commencing domestic EFTS in the HE sector had completed a VET course and an additional 3,300 (1.4%) commencing domestic EFTS had an incomplete VET course, prior to starting their HE studies (NCVER, 2012).

This study takes place at an Australian state university. The university, in question, is publicly funded and enrolled between 20,000 and 26,000 students during the period of the investigation (Universities Australia, 2013). The university in this investigation is a member of the Group of Eight universities, an organisation of research intensive universities which can be equated to the United States (US) Association of American Universities or the United Kingdom (UK) Russell Group (Moody, 2009), and can be considered as the most selective of the universities in the State. In terms of attrition levels, it had the lowest rates of the other state universities during the period of this study (Australian Government, 2014a; Bradley et al., 2008). The university is divided into five faculties: the faculty of Health Sciences; the faculty of Engineering, Computer and Mathematical Sciences (ECMS); the faculty of Professions; the faculty of Sciences; and the faculty of Humanities and Social Sciences (HUMSS). Each faculty administers a large number of bachelor level programs such as the Bachelor of Science or the Bachelor of Arts as well as a smaller number of postgraduate level programs.

In Australia, during the period of the investigation, students could be admitted into university on the basis of (1) a completed high school certificate (2) prior complete or incomplete higher education studies (3) prior complete or incomplete TAFE award studies (4) mature age special entry grounds and (5) other very small categories (see Wheelahan & Moody, 2011). In total student numbers, the university, where this investigation is undertaken, enrolled the highest ratio of traditional students (high school certificate completers, under 21 years of age) and, conversely, the least number of students entering on the basis of a completed VET qualification during the period of this study, when compared to the other universities in the state (Watson, Hagel, & Chesters, 2013).

In this study, the group of students under consideration are taking VET to university pathways, or more simply 'VET entry pathways'. During the study period, between 2005 and 2012, the university also enrolled the least number of students from a low SES background in the state (Australian Government, 2014b; Bradley et al., 2008). The university generally does not provide accommodation for its students. Students only come to the university for study purposes; unlike in many 'residential' institutions in the US, where students reside within university boarding houses. The university is, thus, much closer, in character, to a US 'commuter' university.

### 1.1.2 VET entry pathway attrition rates

Interest in investigating rates of attrition for VET entry pathway students has stemmed from initial analyses of internal university data for students entering on the basis of a completed VET qualification. The analyses have identified that students taking these VET entry pathways have a much higher attrition rate in aggregate terms (between 30% and 70%) than the norm (13% to 14%) at this university. A similar trend has been noted in the past within another similar sized university (Keating, Davies, & Holden, 2006). As is explained in this study, these pathways have been set up to attract students from disadvantaged backgrounds, particularly those students from low socio-economic status (SES) backgrounds, who have persistently been under-represented in the university sector. This under-representation has been particularly prevalent in elite, selective universities not only in Australia but also in other parts of the English-speaking world (James et al., 2008; Yorke & Longden, 2004). To have such students enter and then not complete in a highly regarded Australian university seems to compound the problem of disadvantage while creating a false easing of under-representation. From an institutional perspective, while there are a number of other issues arising around these pathways a better understanding of why these students drop out allows for better planning in terms of transitional support of students once they enter a university.

### 1.1.3 VET pathways: a brief history

In order to appreciate the impact of these VET entry pathways, it is important to examine the events that led to their development and implementation. In March 2008 the then Federal Labour Minister for Education, Julia Gillard, called for a major review of the Australian higher education (HE) sector (Gillard, 2008). Part of the focus was to widen participation to include the under-represented groups of Australian society.

The subsequent '*Review of Australian Higher Education*' (Bradley et al., 2008), simply known as the Bradley Review and named after the review panel's chairperson Professor Denise Bradley, has become the seminal work in this area and has been used as a blueprint for major structural changes in the Australian HE sector (Lomax-Smith, Watson, & Webster, 2011). Despite more recent moves to reassess university funding arrangements by newer governments (Martin, 2015), the review's findings have been instrumental in the Australian Government's investment strategy to shape Australia's HE sector to meet the needs of the Australian community in helping the country and the sector itself to be more competitive in an international context while providing an equitable system for all qualified individuals irrespective of backgrounds or circumstances (Bradley et al., 2008, p. xi; Commonwealth of Australia, 2009; James et al., 2008, p. 22).

#### 1.1.4 Problem with participation of disadvantaged groups

While Australia has been recognized as one of the first countries to try to provide equitable access through structural changes to the HE system (Bradley et al., 2008, p. xii; James et al., 2008, p. 22; McInnis & James, 2004), statistics have shown that disadvantaged sections of the Australian community consistently remained under-represented (Bradley et al., 2008, p. 29; James et al., 2008; Yorke & Longden, 2004, p. 13). The Bradley Review's focus on widening participation was also a major aim of Australia's previous major structural change to the HE sector. Julia Gillard's predecessor in 1988, the then John Dawkins, produced a 'White Paper' which similarly proposed a future equitable HE system (Dawkins, 1988).

This objective has, however, been persistently difficult to achieve throughout the last two decades with many other disadvantaged groups remaining at almost identical levels within this time (Bradley et al., 2008; McInnis & James, 2004; Ramsay, Tranter, Charlton, & Sumner, 1998). The most encompassing of these disadvantaged groups was termed as coming from a low socio-economic status (SES) background, often termed as low SES and commonly assessed as a quartile (25%) of the general population (James et al., 2008; Ramsay et al., 1998). Thus, if access were equal for all, 25 per cent of the university student population would be expected to come from a low SES background.

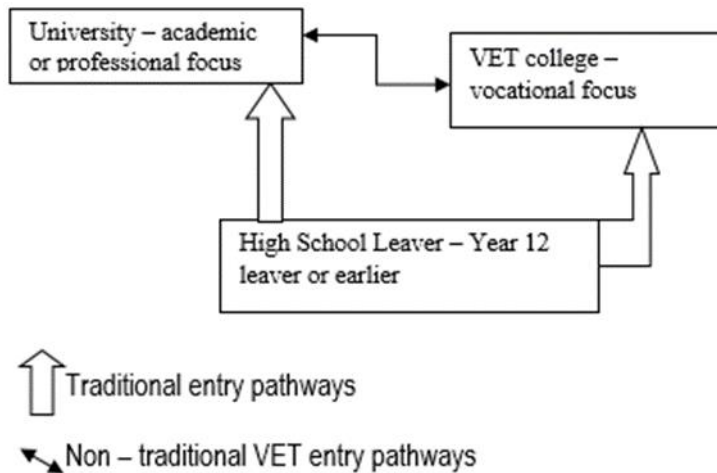
Notwithstanding issues with assessing SES, low SES student participation rates for all Australian universities have consistently fallen well below the 25 per cent level, at around 15 per cent between 1989 and 2007 (Bradley et al., 2008, p. 28).

### 1.1.5 VET entry pathways - giving university access to disadvantaged groups

One of the key recommendations of the Bradley Review helping to achieve equitable access was the setting of targets, tied to future funding, to improve the level of participation of students from low SES backgrounds (Bradley et al., 2008, p. 45). A second recommendation which supported the attainment of these targets was an alignment of the VET and the university sectors within a common framework, and a call for closer links with clearer and stronger pathways between the two sectors (Bradley et al., 2008, p. 179). Both these recommendations were promptly implemented (Commonwealth of Australia, 2009; Lomax-Smith et al., 2011; Pattison, 2012).

The rationale behind the idea that the VET entry pathways allowed greater access to disadvantaged groups of Australian society came from previous analyses of the Australian VET sector. James (2002) argued that school students coming from a low SES background tended to value a VET course more than a university course. Curtis (2008) reported that overall the VET sector was more successful in attracting disadvantaged school leavers and in particular those from low SES backgrounds. Foley (2007) found that the VET sector was able to recruit a relatively high percentage of low SES students due to its regional focus.

These findings have been contrasted by studies showing that low SES students were concentrated in the lower levels of VET qualifications (Wheelahan, 2009). Notwithstanding this apparent stratification of the VET student socio-economic profile according to VET qualification level, the Bradley review panel and other educational researchers have advocated the strengthening of pathways between the sectors (Aird, Miller, Van Megen, & Buys, 2010; Blacker, Paez, Jackson, Byrnes, & Dwyer, 2011; Bradley et al., 2008; James et al., 2008; Lomax-Smith et al., 2011). Subsequently, many new VET entry pathways have been established at many Australian universities (Watson et al., 2013) including a substantial number at the university involved in this investigation.



**Figure 1.1 Traditional and non-traditional VET pathways to university**

The figure shows two pathways for entry into an Australian university.

In the past, a high school leaver would usually choose either a VET college or a university (as is indicated in Figure 1.1). While pathways between the two tertiary education sectors (i.e. VET and university) in the Australian context have been encouraged since the 1980s (Bradley et al., 2008, p. 192), it has been difficult to envisage such pathways operating smoothly due partly to these sectors having different foci (Bradley et al., 2008, p. 212). The universities have concentrated on professional and academic outcomes and the VET colleges have focused on vocational, job-related outcomes. Typically, if school leavers chose to take up an apprenticeship through a VET college, they would leave high school at an earlier age level than a student wishing to go on to university (Curtis, 2008). Thus, in the past most VET students and even VET graduates had not obtained the high school Year 12 prerequisite qualification traditionally used for university entry (James et al., 2008). Another barrier to the smooth implementation of these cross-sectoral pathways has been the different ways each tertiary sector approached its instruction and assessment (Bradley et al., 2008, p. 192). Namely, the VET sector used competency based learning and assessment predetermined by specific job-skill needs, while the university sector based their judgement on scholarly knowledge, research driven and shaped by the sector's academics (Bradley et al., 2008, p. 212; Wheelahan & Moody, 2011).

In recent times, however, the boundaries between these sectors have become less defined with the rise of dual sector institutions and with both universities and VET colleges offering levels of courses and fields of study that seemed to straddle both sectors (Moody, 2009, 2012; Wheelahan, Arkoudis, Moody, Fredman, & Bexley, 2012). For example, an individual might have considered studying engineering up to an advanced diploma level at an Australian VET college or

to a bachelor level in an Australian university with similar occupational outcomes (Moody, 2012). Submissions to the Bradley Review had pointed out the growing importance of the reverse pathway (i.e. university to VET), so that university graduates might gain skills appropriate for specific workplaces (Bradley et al., 2008, p. 212).

### 1.1.6 Pathways in international contexts

Similar pathways between the VET and university sectors were evident in a number of other countries around the world. Byrnes, Paez, Jackson, Dwyer and Blacker (2011) described the development of over-arching frameworks that were enveloping both university and VET sectors across the world.

The 'Bologna Process', signed in 1999 by the Education ministers from 46 European countries, aimed to establish smooth transfer processes for students wishing to transfer between sectors and countries. In the 2009 follow-up meeting the respective education ministers set goals for widening participation of under-represented groups (Byrnes et al., 2011, p. 48) in a move similar to the Bradley Review process. The resulting activity in Europe on National Quality Frameworks and Credit Transfer Systems had begun the task of standardizing and regulating the movement of students between the different participating countries in Europe (Byrnes et al., 2011, pp. 49-54). Considering the variety of contexts involved in this European process, it was not surprising to see issues arising that slowed the overall progress of the Bologna initiatives (Byrnes et al., 2011, p. 52).

The United Kingdom (UK) was one of the European countries where there was considerable separation between the VET and university sectors (Byrnes et al., 2011, p. 55). However, VET had also been viewed as an alternative non-academic pathway to a university course for a wider range of students (Hoelscher, Hayward, Ertl, & Dunbar, 2008). In particular, Foundation Degrees, (2-year degrees) delivered by universities and VET colleges, had acted as a pathway between the sectors. These had been introduced to redress the low participation rates of disadvantaged students, and had become popular and seemingly successful in increasing the university enrolments of students of diverse educational backgrounds, including those with completed VET level qualifications (Byrnes et al., 2011, p. 56; Hart, 2012; HEFCE, 2010; Yorke & Longden, 2004). Additionally, one year VET level courses, namely the Access to Higher Education

Diploma, delivered by further education colleges have been specifically introduced as a bridging qualification for UK universities (James et al., 2008).

In Canada, some provinces have put considerable effort into articulation between the VET and university sectors. British Columbia, for example, established a dedicated independent organisation, which dealt with the post-secondary movement of students between the two sectors. The British Columbia Council on Admissions and Transfer managed pathway or articulation agreements ensuring a fair and transparent system based on revised principles and guidelines of best practice (Byrnes et al., 2011, p. 59).

It is difficult not to include the United States of America (US) context within this discussion as it is in this country where most academic investigations of higher education had taken place. The divisions in this country were not as easily seen due to the large number of higher education institutions that were both public and private. Probably the clearest demarcation was along the lines of the four year university style colleges and the two year community colleges (Braxton, Hirschy, & McClendon, 2004), with the two year colleges issuing the more vocational type degrees and the four year institutions being more comparable to the Australian and UK university sectors. Pathways between the two institutional levels were commonplace in the US (Bers & Smith, 1991; Moody, 2003) and have been viewed as helping to redress the imbalance of the system favouring the white, upper SES background students (Carter, 2006). Pathways, however, have been difficult to monitor due to the relatively decentralized, free market nature of the HE system in the US (Yorke & Longden, 2004). In one comparative investigation of transfers between 2-year and 4-year public HE institutions in three US states, Moodie (2003) found that, similar to the Australian context, highly selective universities accepted fewer (about half) of the transfer students than less selective universities.

It thus appeared that, like in Australia, in many developed countries around the world, pathways between the different higher education institutional strata had been introduced as a strategy for providing access to a wider range of students (Hoelscher et al., 2008; James et al., 2008).

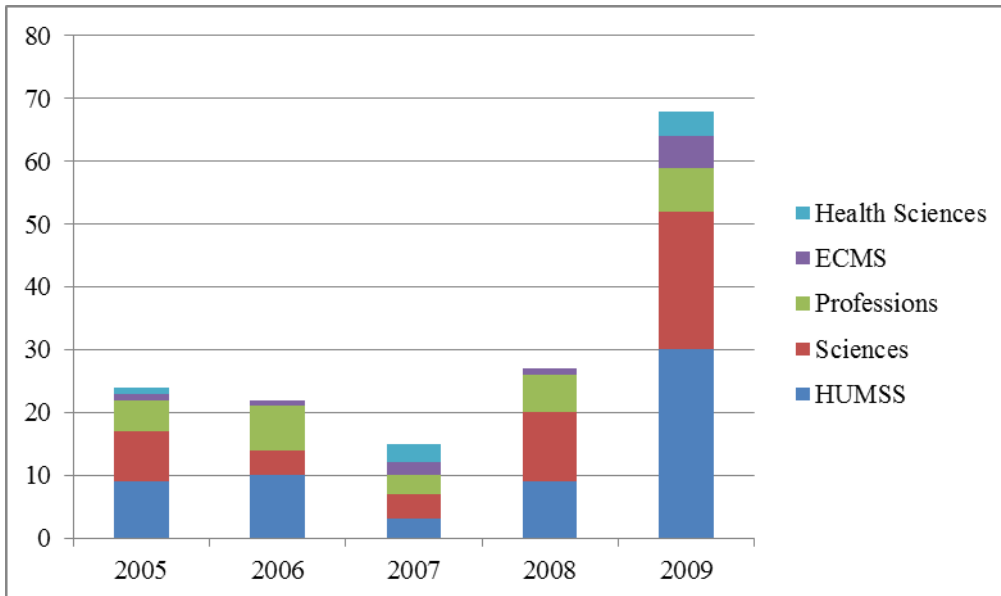
### 1.1.7 A tentative relationship emerges

Institutional investigations at the university in this investigation identified a possible statistical trend for VET entry pathway students. At the tail end of the period spanning between 2005 and 2009, as mentioned previously, political and institutional efforts were being made to foster university enrolments of VET graduates. Between 2008 and 2009 over 100 new VET-to-university transfer credit pathways were established at the university under consideration. This resulted in a rapid growth in enrolments of students entering the university on the basis of a completed VET qualification, at the institutional level and at the faculty level (as is shown in Figure 1.2). This growth in these overall student numbers was due to enrolment growth in specific programs, such as the Bachelor of Science. At the same time, the overall aggregate attrition rate dropped dramatically for this so called 'VET entrant' group of students (as is indicated in Figure 1.3).

From Figure 1.2 and Figure 1.3 several issues arise which can be investigated in greater detail. The first issue is that of the rise in enrolments. It is interesting to consider whether students who are recruited have consciously taken advantage of the credit transfer pathways that are available. It is likely to be of value to investigate which of these pathways is more successful in the recruitment of students and why. Whether these pathways are having the intended aim of providing greater access to low SES students is also of great concern. It may also be of use to view the performance of these students and how they compare to the more traditional cohorts.

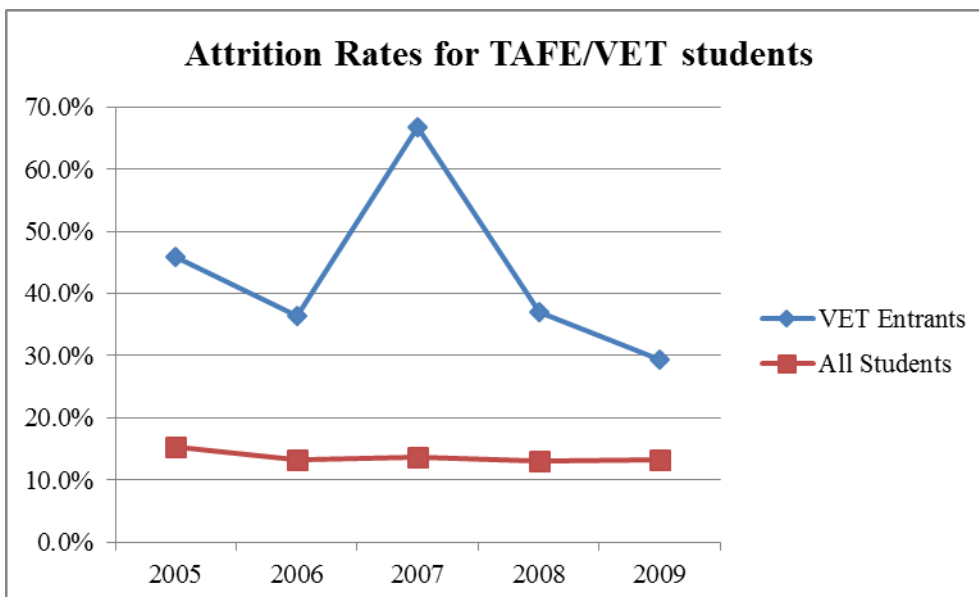
Figure 1.3 also provides information on the performance of the VET entrant cohort and also indicates a more pressing issue. On average, the VET entrants are dropping out at a greater rate than the overall average for all students in the university. The graph also shows that the difference is at least two-fold for the whole period under consideration and in 2007 the attrition figure for the VET entrants peak is more than three times larger for this group as a whole.





**Figure 1.2 University VET entrant enrolments**

University student enrolments on the basis of a completed VET qualification showing enrolments by faculty. The bar chart shows the number of students (y-axis) enrolling for the first time between the years 2005 and 2009 (x-axis) within specific faculties (different colours within the bars). Note ECMS=Engineering Computer maths Sciences, HUMSS=Humanities and Social Sciences.



**Figure 1.3 Attrition rates for VET entrants**

University attrition rates for students entering on the basis of a completed VET qualification compared to average attrition rates for all students. The graph shows the attrition rate (y-axis) of the student cohort that first enrolled between the years of 2005 and 2009 (x-axis). The attrition rate is expressed as a percentage and calculated using the total number of students that dropped out (within the first year of enrolment) over the total number of all student enrolments for that year.

## 1.2 Problem statement

Facilitating the entrance of this group of students, admitted on the basis of a completed VET qualification, and then allowing them to drop out at unacceptable rates risks undermining the entire aim of allowing greater access. Thus, the problem addressed in this current study is to find some of the reasons why this group of students have a high average attrition rate. A connected issue is also to investigate why the attrition rate changed and peaked for this group of students. This second issue is of particular academic significance. Attrition rates when viewed longitudinally had usually been stubbornly persistent over many years (Bradley et al., 2008; Tinto, 1993). Thus to try and explain this variation, during a time when attrition rates were fluctuating to a greater extent than expected, promised to unravel some of the mysteries that had traditionally been associated with the undergraduate attrition issue.

Consequently, it is more meaningful and of greater relevance to develop a related investigation. Thus, this study proposes to examine 'VET entrant' peer group sizes and if possible both program level and faculty level factors related to student attrition. The reason for including these factors influencing attrition stems from a preliminary institutional investigation undertaken with this group of students. When viewing the two graphs seen in in Figure 1.2 and Figure 1.3, an inverse correlation between enrolment size and attrition rate between 2005 and 2009 for this group of students seems to appear. Decreasing attrition rate with increasing enrolments is seen to occur both before and after 2007, the year for which enrolments for this group of students are at their lowest. As Braxton, Hirschy and McClendon (2004, p. 20) suggested, due to the complexity of the issues involved, theoretical factors related to attrition should emanate from student observation in an inductive manner. Thus, it may be of greater meaning to investigate the evaluation of VET entrant 'peer group' sizes as an additional factor related to attrition in this research situation. While considering a number of factors of attrition, special focus is thus given in this current study to the factors of 'peer group sizes' at the program and faculty levels.

Thus, the problem being investigated in this study is that of attrition within the context of the newly established VET entry pathways at an Australian university. This leads to the research questions for this current investigation and research study.

## 1.3 Research questions

This research study addresses a number of questions regarding the recently developed VET entry pathways to the university under consideration. These include:

- 1) What are the factors of attrition at the individual, program and faculty levels, and how are these factors interrelated for students entering the university on the basis of a completed VET qualification?
- 2) Are peer group sizes, in terms of number of VET entry students at the program level and at the faculty level, factors that influence attrition among students within these VET entry pathways?
- 3) In what significant ways do peer group effects influence student attrition?

## 1.4 Significance of the study

VET entry pathways provide many opportunities for research. The subject is very topical following the Bradley Review and subsequent educational government funding arrangements. While such pathways are not a new concept in Australian universities that have intrinsic social inclusion interests (Charles Darwin University, 2012; Hassard, 2011; University of South Australia, 2010), changes to funding, mentioned earlier, have resulted in many new pathways in Australian universities that have hitherto not been examined with respect to 'alternative' non-traditional pathways (Group of Eight Australia, 2012; Lomax-Smith et al., 2011, p. 122).

Educators have emphasized the need for research into all aspects of these pathways as to whether they are successful in improving the 'aspiration', 'achievement' and 'retention' of new undergraduate students (Lomax-Smith et al., 2011). It is the last of these, namely retention (and attrition), that is the focus of this current research study.

### 1.4.1 Lack of research on attrition and retention: a practical perspective

Attrition rates of VET entry pathways have been of great interest particularly because of their use as performance indicators for universities in general (Gabb, Milne, & Cao, 2006; Yorke & Longden, 2004, p. 65). Changes that have taken place due to the Bradley recommendations with regard to low SES incentive funding have been argued to need close monitoring from both the

institutional and overall government strategic perspectives. Completion rates, which are directly linked to attrition rates, have been identified and singled out as a key performance indicator (Bradley et al., 2008, pp. 39-40; Lomax-Smith et al., 2011, pp. 75,80)

Academic focus has centred on the lack of knowledge of student experience and associated attrition within these pathways (Wheelahan & Moody, 2011). Aird et al. (2010) have noted that there is a general lack of studies dealing with 'attrition rates' of low SES students at universities. Devlin and O'Shea (2011) reported that completion and attrition rate studies in Australia were rarely undertaken. This study thus fills these research gaps. Interestingly, as pointed out during a forum on attrition in Australia, the university sector, unlike the VET sector, did not ordinarily survey students who did not complete their studies (Karmel, 2012). Surveys and semi-structured interviews with this group of students form the basis for this investigation.

This study's significance is also highly relevant in its use of recently developed multilevel statistical modelling to examine the complex multilevel and multivariate issues. The statistical methods employed are able to examine the many variables involved that influence whether students withdraw from their studies and estimate the relative effect sizes for each of the variables. Academic scholars on this topic have advocated the use of methods that partial out reasons for dropping out (Braxton et al., 2004), particularly in contexts, such as the one for this study, where success is less likely (Braxton et al., 2014; Yorke & Longden, 2004, pp. 71-72).

Of practical significance is the fact that this study deals with data from a member of the 'Group of Eight' universities in Australia, which consistently underperform as a group in terms of low SES enrolments (Bradley et al., 2008, p. 30; Wheelahan, 2009). This investigation could thus provide valuable information into the successes of this relatively new type of student, and also an understanding of how this section of the Australian HE sector provides wider access.

The university in this investigation is also of particular interest because VET entry pathways have been introduced without significant support structures. For example, transitional peer group mentoring arrangements, which are common-place for other groups within the university throughout the study period, have not been established for the VET entrants. Thus, in this institutional context, VET entrant peer groups, and their effects, can possibly be viewed as changes that have taken place with little institutional impetus. This possible 'natural' occurrence

is elaborated on in the explanation of the theoretical model and its basis on social or collective behaviour in a new situation for research.

#### 1.4.2 Faculty and program peer group sizes, untested theoretical factors influencing attrition

This research study investigates, among other possible causal links, the relationships between peer group sizes at the program and faculty levels and the attrition rate of VET entry pathways. These factors of attrition, while never being considered in discussions of attrition and retention in this specific context, have rarely been considered in previous research studies. Tinto (1993) constructed his 'general' theoretical framework of HE student attrition from considering past social anthropological studies on rites of passage through different community locations and theories of suicide as applied to persistence. He reviewed psychological, structural-functional, conflict, economic, societal and organisational theories in his discussions but dismissed their importance at the individual student attrition level. His model highlighted the influence of peer group interactions on the attainment of social and academic integration and he even deduced the need for a critical mass for each subgroup present in a higher education institution. His model, however, did not include any peer group effects such as peer group size, nor did it consider other attributes that could be affected by peer group size at the program, faculty level and possibly at the institution level, and therefore confined this 'peer group size' aspect to what could be termed as a by-product rather than a central theme.

Similarly, Braxton, Hirschy and McClendon (2004) mirrored Tinto's concept of the need for a critical mass of students when considering ethnic minority groups. Yet, once again, group sizes, at any level, were not included in any of the models they re-theorized using the 'Tinto template'. Braxton and his colleagues also conceptualized a new factor where group sizes could have had a bearing. The concept they termed as 'communal potential' was defined as an individual student's conscious view that they had the potential to join a sub-group within which they shared some common attributes or values (Braxton et al., 2014; Braxton & Hirschy, 2004; Braxton et al., 2004). There is, therefore, a possibility that as a minority group's size, at any level, increases each individual student from that minority increases their communal potential. However, these possible connections remained unmentioned. In three pivotal studies, one focusing on psychological wellbeing and two focusing on student attrition, however, group sizes were considered at the social network level.

In the first study, concerned with the way in which social networks develop and influence psychological wellbeing, Hays and Oxley (1986) sought to identify social network characteristics that were associated with psychological wellbeing and positive adaptation to a university. Their adaptation construct included satisfaction with social experiences at the university. While their sample was restricted to young, white, single, first term students, the authors were able to make some comparisons between residential and commuting students. The study, like Thomas' (2000) later investigation focusing on student attrition, assessed social network composition including the number of acquaintances and close friends present within the networks. Of interest to this current investigation, the study found that the number of fellow student members within the student social networks was the most strongly related variable to college adaptation. However, these significant findings on student network sizes were not applied to any subsequent studies focusing on student attrition.

In the second study, Thomas (2000), using a psychological theoretical lens to investigate the college student attrition issue, assessed friendship group 'clique sizes' but did not include these in his analyses. He did, however, identify this variable for future research, "Although these differences [between clique sizes] are not modeled in the present study, the exploitation of such differences provides promising areas for future research" (Thomas, 2000, p. 603).

In the third pivotal study, Swenson Goguen, Hiester and Nordstruom (2010) focused on the feelings of belonging or being a member of the institution. They took a complex view of the friendship group, considering new friends made at university as beneficial to this sense of membership, while friendships with old high school friends, present at the same university, as detrimental to this membership. Thus, they excluded old friends from their variable of 'number of close friends'. This new friend group size variable was then assessed for its effects on performance and persistence.

Peer group sizes at the program level and faculty level were, however, not considered in any of these three studies, as they were not hypothesized to have any influence on theoretical grounds. The three studies were also largely based on psychological theoretical underpinnings as they focused largely on social network composition rather than numerical sizes. Even Hays and

Oxley's study, which took network sizes into account, included family members as part of the network and restricted overall network sizes to 10 members.

### 1.4.3 Attrition viewed through new theoretical perspectives

Researchers of attrition while often favouring the psychological and sociological theoretical bases have consistently advocated the use of multiple theoretical perspectives to view the issue (Braxton et al., 2014; Braxton et al., 2004). Most comprehensive models of attrition have been recognized as a fusion of concepts emanating from different theoretical underpinnings (Yorke & Longden, 2004). It seems reasonable to expect that new theoretical lenses may focus upon previously explained factors in a new manner and that possibly new factors may be uncovered. This investigation makes use of a number of theoretical perspectives used in past investigations, together with perspectives that have not been used before.

This study, thus, explores the reasons for attrition within these new pathways at an early stage of their implementation using a theoretical model with program peer group size as one of its central factors. The study takes the opportunity of exploring reasons of attrition at a time when student numbers are rapidly changing for this cohort of students. The principles of human collective behaviour (Goldstone & Janssen, 2005; Sumpter, 2006) and recent neuroscientific evidence on the decision making process (Eagleman, 2015) for the first time inform such a model of attrition. A natural explainable tendency to group in order to survive unfamiliar situations may be a significant occurrence when considering educational contexts involving attrition of new entrants. Indeed, if such a relationship between peer group size, at either program or faculty level, and attrition can be explained, the findings may impact on how institutions view and perceive the introduction of any new groups in a higher educational setting, and in particular those which are intended to allow wider participation.

### 1.4.4 Attrition assessed with primary and secondary data analysed using contemporary techniques

Educators have stressed the importance of using contemporary statistical methods and the latest analytical tools (Aird et al., 2010; Nora & Crisp, 2012).

In order to assess the influence of variables, including the variable of peer group sizes, on student attrition, several methods of data collection are used. Secondary data, for students

entering the university on the basis of a completed VET qualification, are extracted from the university records. Data are also collected for the programs and the faculties in which these students enrolled. Additional student data are collected from the records of the state admissions centre<sup>1</sup>. A survey instrument is used to gather primary data from the students identified from the university records. The Statistical Package for the Social Sciences (SPSS) (IBM Corporation, 2011) and the Analysis of Moment Structures (AMOS) (Arbuckle, 2011) programs are used for initial reliability, exploratory and confirmatory analyses. The structural equation modelling software program of Mplus (Muthen & Muthen, 1998-2012) is used to assess influences from the various significant factors at the student level on student Drop Out, the dependent outcome variable. A type of Hierarchical Linear Modelling approach, the so-called Hierarchical General Linear Modelling, is used to address the multilevel nature of the models and the data and to assess the influence of program and faculty level factors on the dependent outcome variable.

## **1.5 Limitations of the study**

This investigation, centred on undergraduate student attrition, has specific limitations. The study is based on data at a single institution. It is therefore debatable whether results are transferable to a wider context that include other university settings. However, being at a single institution also limits variability due to inter institutional differences and allows for a more natural isolation of the tested variables. As discussed previously, a focus of this study are the effects of peer group sizes, at the various levels, on attrition. This set of factors may best be assessed when group sizes vary in a 'natural' setting. The time span of the investigation allows for this to take place, as peer group sizes, as measured in this study, vary greatly. Minimum peer group sizes of one or two students are recorded when entry pathways are first established. When these pathways are well established, peer group sizes tend to increase as more VET entrants take advantage of the new entry pathways.

Another limitation of this study is the retrospective manner in which it is conducted. Academic studies that concentrate on attrition after the event has occurred are often termed as 'autopsy studies'. This study, which begins in 2012, gathers survey and interview data in 2014 from students who withdraw from their studies between 2005 and 2012. Autopsy studies, like this one,

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<sup>1</sup> University admissions in Australia are administered on behalf of universities through stat-run admission centres that collect their own data from prospective students.



are prone to several forms of bias. Yorke and McClendon (2004, p. 104) made a non-exhaustive list of biases, attributable to such studies, which included: non-response, self-justification, misattribution of cause, selective memory, and distortion due to passage of time. However, they also acknowledged the difficulties with conducting investigations using alternative methodologies to assess the issue. Comprehensive longitudinal studies are costly and difficult to administer and often simply not feasible. If this particular study was done in a contemporaneous, longitudinal manner it would have needed to collect student data for at least 10 years. Its focus is largely directed following a retrospective analysis of the institutional data. Such attrition rates are not regularly reported for different groups within the university. The peak attrition rate of 2007 coupled with decreased enrolments for this cohort of students seen in Figure 1.2 and Figure 1.3, was first assessed in 2012.

Other limitations are introduced by the treatment of data and particularly its categorization. For example, students are categorized by year rather than semester cohorts. So that a student having joined a particular program, say the Bachelor of Science, in Semester 2 is considered to be in the same group as other students joining in Semester 1. This grouping of students is done following a discussion with university entrance counsellors and a random check of course timetables which confirms that Semester 2 students generally join their Semester 1 counterparts for the same lectures in at least their initial semester of studies. The university also has double degree entrants. For example, a student may enter both a Bachelor of Arts and a Bachelor of International Studies at the same time. However, data for double degree entrants is excluded from the analysis. This is done for two reasons. First of all, it is very difficult to allocate these double degree students to a particular group, as these are determined by the program, and faculty, in which the students are enrolled. A second reason is that it is difficult to ascertain from student records whether students drop out from one program while continuing in another. It may be that the decision drop out is very different for double degree entrants. Therefore, the original 542 students are reduced to 511 students that initially enrol in a single program.

A further limitation is that, for this university, not all programs have VET pathways entrants. So, conclusions made are for those programs within the university that have these VET entry pathways. It is important to recognize that the more highly competitive programs, such as medicine and law, have no such pathways or have recently discontinued them. This uneven distribution of VET entry pathways according to competitiveness has been documented,

particularly at the institutional level. Watson, Hagel and Chesters (2013) noted that despite being committed to providing VET pathways the more 'competitive' Go8 universities, including the university in this investigation, had the lowest number of recorded VET entrants.

Another limitation is the accuracy of the institutional data. A method of triangulation is used to validate whether students enrol on the basis of a completed VET qualification. The list of all students in this category is firstly compiled from the university records. Then each student on this initial list is individually crosschecked using the state admission centre's records. This process allows the compilation of extra data on each individual student that is gathered by the admission centre, such as student preference for the enrolled program and for the university. Using this triangulation process, several students are excluded as they are found to be miscategorised in the university records. For example, a number of students categorized as having entered 'on the basis of completed VET qualification', i.e. a VET pathway, in the university records are found in the state admission centre's records as having entered 'on mature entry' grounds using a STAT (Special Tertiary Admissions Test) score. It is likely that the reverse happened, i.e. a number of students who enter through a VET pathway may also have been miscategorised into another category such as the mature entry one. However, this could not be checked in the available time. Thus, peer group sizes may be underestimated to some degree.

A final limitation is that this study only regarded institutional attrition during the first year of enrolment. First year attrition has been the accepted norm in studies referring to attrition or retention, due to this period being when most withdrawals take place (Brunsdon, Davies, Shevlin, & Bracken, 2008; Tinto, 1993). Thus for convenience purposes attrition, which can theoretically occur at any stage, is assessed after this most critical of periods. The assessment of attrition is also limited to one institution. Students could only be traced to have left the university in the investigation. A student may have left this university only to continue their HE studies at another university. Long, Ferrier and Heagney (2006) reasoned that students were less likely to do this at selective universities like the one in this study. In any case, this so-called system attrition, that is when a student leaves the HE system permanently (Tinto, 1993), cannot be evaluated, as the study gathers data on student attrition at one university. Nevertheless, institutional attrition is of great interest to both government educational agencies and to the institution itself.

## 1.6 Structure of the thesis

This thesis is divided into 11 chapters. The first chapter describes the background setting for the study. This first chapter also includes the issue in focus and the research questions that are addressed. The second chapter defines student attrition and retention as they are used in this text. The chapter then reviews past studies that are related to the topic of student attrition in Australia and in other countries. In addition, the second chapter introduces the theoretical foundations for the research undertaken in this investigation. The third chapter introduces the research model of the investigation and describes the three structural levels of variables within it and how the variables within these levels are operationalized. Chapter 4 describes the methods used to collect and analyse the primary and secondary data sets used to address the study's research aims.

Chapter 5 considers the reliability and validity of the various latent variables used in the analyses. Chapter 6 goes through the descriptive statistics for all the variables involved in the study. Chapter 7 is the first of three results-based chapters. In this chapter the student (single) level path model is reported and variables within it are discussed, with regard to direct and indirect influences on the student Drop Out outcome. Chapter 8 describes the two level path model which incorporates the Program Peer Group Size variable. Chapter 9 reports the qualitative results obtained from the participant interviews. Chapter 10, then discusses these results with reference to the study's research aims. A section dealing with policy implications and suggestions for further research concludes the reporting of this study. Finally, Chapter 11 summarizes and concludes the investigation. This final chapter also includes a section on possible implications and suggestions for further research.

## **2 Review of Research into Attrition and Multilevel Analyses in the Context of Higher Education**

This chapter examines other studies that are relevant to this investigation. The studies chosen consider the variables that are assessed in this investigation in a historical context. The overall structure of the review also examines the methodological advances that have led to the contemporary techniques and approaches that are used in this study. Thus, the Australian based studies within this structure feature first as they use statistical approaches that are more rudimentary in nature.

The chapter is divided into four sections. In the first section, the various terms used to describe student departure from university are defined with particular reference to this investigation. In the second section past Australian studies are reviewed and compared. In the third section, past studies that have been undertaken primarily in the United States (US) and that are relevant to this investigation are reviewed in a historical sequence emphasizing the methodological advances made. Finally, in the fourth section, the research model for this investigation is described and explained.

### **2.1 Defining attrition**

As this study deals with student attrition at an Australian university it is appropriate that a definition of attrition is advanced at this stage. When a student withdraws or drops out of a particular program at an Australian university, they do so voluntarily or are forced to do so because of insufficient academic progress. Conversely, if students continue with their studies they are often termed as 'persisting'. The effects can be seen from the student's perspective and from the institution's and course of study perspective where the course has one fewer student. If 20 students had started a program of study at the beginning of the year and one dropped out during the first year, the attrition rate would be one in 20 or five per cent. Attrition is, thus, defined as the proportion of students who drop out during a specified period of time. It can be assessed for a particular program as well as for a particular university. The direct opposite of 'attrition', as seen by the institution, is 'retention'. Thus, the first year retention rate for the above example would be 95 per cent.

Of importance also is the time when the student drops out. Usually a student enrolls in a program, perhaps, the Bachelor of Science, and early into the first semester, at an identified 'census date', the student has to make a commitment to continue and, in the case of a fee paying student, needs to pay fees, or make an arrangement for the fees to be paid. A student, therefore, can withdraw before or after the census date, at any stage, during the period that he or she is enrolled. The student then either withdraws or eventually completes the degree.

Some students may also withdraw from one program and enter another within the same university; for example, the student who entered the Bachelor of Science program switches to a Bachelor of Arts program. Some students can also withdraw from one university and transfer to another university. The action of staying on in the higher education system while changing universities is often termed 'system persistence'. Another possibility is that a student withdraws temporarily before returning back to the original university within the same program. That student may even enrol in a different program than the one originally enrolled in, before the temporary pause. As the tertiary education system in Australia includes the VET sector institutions, a student can also choose to transfer into a different sector.

The possibilities are numerous and, as a number of researchers point out, investigating these processes can be complicated. Any study dealing with attrition also necessarily needs to be of a longitudinal nature, as a student's enrolment status needs to be checked at least on two occasions to infer whether students have dropped out or persisted. Tinto (1993) bluntly explained that once a student enrolled into the university system there were two basic possible outcomes: they either graduated or died before they did so, because the act of 'dropping out' or 'not persisting' could be reversed at any time during a lifetime.

As the majority of the studies that are published emanate from the US, it is also important to emphasize some of the differences in the way in which attrition is assessed in that country. US studies usually report only first year attrition and retention rates for first-time students, but exclude students who are enrolled part-time and those who first enrol in the smaller intake of the 'spring' semester (equivalent to Semester 2 in this investigation). While there was general consensus among educational theorists that this should not be the case, the US Department of Education required the reporting of retention figures from the 3,000 or more universities that did

not include these two groups of students (Seidman, 2012). Higher education in the US also encompassed a wider range of institutions including major research institutions with teaching, large state-sponsored comprehensive universities, highly selective private liberal arts universities, 'for profit' institutions, and two-year community colleges (Yorke & Longden, 2004, p. 15). The community colleges may be considered to resemble TAFE colleges in the Australian VET sector rather than Australian universities. Thus, comparisons between Australian and US retention and attrition rates need to be considered with considerable caution.

In this study, 'attrition', unless otherwise stated, is defined as having occurred after the census date during the first year of enrolment. If students switch programs within this first year or at the start of the second year, without leaving the university, they are not considered as dropping out. However, if students pause their studies sometime in their first year and are not enrolled when the census date comes around one year after their first enrolment, they are considered as having dropped out, even though they may return some time later. All domestic students are considered, including those enrolled part-time and those starting in the second semester intake. This 'first year' attrition is what is usually assessed and reported in official Australian records, and this study also employs this definition. This study also often refers to retention and takes Hagedorn's view that this notion and attrition are 'two sides of the same coin' (Hagedorn, 2012, p. 83), and thus retention is defined as students persisting to the second year of enrolment.

Measuring attrition (and retention) only in the first year is particularly appropriate for this study. Attrition studies consistently show that the first year is when the greatest attrition occurs. It is not surprising that many first year students drop out. As students transition from high school or VET college environments, where they may be closely guided and monitored, to university environments, where they are expected to be more self-reliant, there are more likely to be issues concerned with student performance and persistence. There is overwhelming evidence that, this first year is the most critical period of university students' study lives. It is also not surprising that efforts to improve retention by and large concentrate on this first year.

Secondly, recording only first year attrition in the university context, removes the need for separating students into voluntary and forced withdrawal. This is because, at this university, students are given at least one chance of repeating failed subjects. As the vast majority of program subjects are only offered once a year, it is half way through a student's second year of

enrolment that possible forced withdrawal may take place. Dividing students along these different kinds of withdrawals is debateable. Tinto (1993) has advocated concentrating efforts on understanding the factors of attrition of only the voluntary drop outs, arguing that it was only this group which was in need of support. More recent thought, however, has been that the two groups should not be divided on theoretical grounds and from equity perspectives (Braxton et al., 2014).

## **2.2 Review of past Australian studies on attrition**

There have been few Australian studies on university student attrition and those that have been undertaken with a quantitative view of the issue have utilized rudimentary statistical tools of analysing data. In a review of the Australian research on the topic, Aird et al (2010) have noted that many of the studies have been either been restricted to institutional contexts or have been commissioned by governmental agencies. Nevertheless, only some of the more important Australian studies are presented here. The section is prefaced by a review of the Australian government statistics that have been compiled and that are relevant to this investigation.

### **2.2.1 Australian government statistics**

Student attrition is one of the key university student outcome indicators reported by the Australian Government Department of Education in its statistics collection, the Higher Education Student Collection (HESC). In relation to the time period relevant to this investigation, government statistics showed that overall attrition rates tended to drop immediately after the millennium. However, much of this drop was assessed to be due to improving rates of retention for international students enrolled in Australian universities (Australian Government, 2004). The rates of attrition also varied greatly between institutions. Other noted differences were of higher attrition rates for older students and lower attrition rates for school leavers (Australian Government, 2004). Additional factors of attrition indicated by multiple regression techniques applied to the Department of Education data were: (a) basis of admission, (b) field of study, (c) whether a student was enrolled part-time or full-time and (d) most significantly on a student's Australian Tertiary Academic Rank (ATAR) score (or ENTER score as it was known at the time) (Gabb et al., 2006). For the university in this investigation, overall attrition rates for domestic students changed marginally for the period relevant to this study from 2005 to 2012. Of particular note is the marginal attrition rate rise from 15 per cent in 2008 to 18 per cent in 2012. This rate was well below that recorded for the other universities in the State that consistently reported rates

of above 20 per cent for the same period (Australian Government, 2014a). Attrition rates for all the universities were also assessed for low SES students from 2007. These rates also rose marginally at the university from 16 per cent in 2008 to 18 per cent in 2012 (Australian Government, 2014b).

In 2005, a new student identification number was introduced, able to track students transferring from one higher education institution to another. The so-called Commonwealth Higher Education Student Support Number (CHESSN), facilitated investigations on system attrition. In a more recent investigation using the HESC CHESSN data for the four yearly cohorts of students entering university between 2005 and 2008, Edwards and McMillan (2015) investigated attrition and completion rates by following these cohorts until 2013. They found that rates of attrition and completion were relatively stable in their character over the period and that in terms of equity group outcomes, low SES students had higher attrition rates (16.3% average) than those recorded for all domestic students (14.0% average). Other main variables that indicated a higher attrition rate were part-time enrolment, low ATAR scores and age over 25.

### 2.2.2 ACER reports on LSAY and AUSSE data

National research centres such as the National Centre for Vocational Educational Research (NCVER) and the Australian Council for Educational Research (ACER) have funded research on attrition. These national bodies have also been given the responsibility of archiving two important longitudinal student surveys that have been used to assess university student attrition: the Longitudinal Surveys of Australian Youth (LSAY); and the Australasian Survey of Student Engagement (AUSSE).

ACER sponsored a number of studies on attrition using data from LSAY, which followed students from 'year 9' of high school at the age 14 or 15 until the age of 25. By surveying students who agreed to participate on a yearly basis, LSAY was able to follow many who entered university and subsequently might or might not have persisted past the first year of university. McMillan (2005) assessed the first year 9 cohort in 1995 by following their progress through to 2001. The active sample of 2,593, at the end of 2001, was weighted to correct for fewer responses from those who had withdrawn from HE studies. Logistic regression was used to assess what factors, gathered from the yearly surveys, significantly predicted student retention or attrition. Results showed that a student's high school performance as indicated by their reported ATAR scores



was a significant predictor of retention. Other significant factors of attrition were: field of education; working more than 10 hours per week in outside employment; and coming from an English Speaking Background (ESB). McMillan also noted the prevalent movement of students between the VET and HE sectors. One observation about these students was that those who first went to VET before entering university generally had lower high school performance scores than those who moved directly into university from high school. The time span, however, did not allow an investigation into the performance and attrition of students entering university through 'completed' VET studies, the very topic of this research study.

Also funded by ACER, Marks (2007) investigated the same cohort as McMillan but followed it until 2004. Also using logistic regression to evaluate influences on attrition or retention, Marks found self-reported ATAR scores as the strongest predictor of retention. Females were also found more likely to complete their degrees. Field of education was again found to be a predictor of attrition. Of interest to this current investigation, Marks noted, high prestige courses such as law and medicine were associated with the lowest attrition rates.

Several limitations were acknowledged, by both Marks (2007) and McMillan (2005), when using LSAY data. LSAY only surveys young students. Samples from LSAY were therefore very different and more 'traditional' in character (Bean & Metzner, 1985) than the VET entrants investigated in this current study. Logistic regression, used by both authors, was also limited in estimating indirect effects, which might have been better considered using path analysis or Structural Equation Modelling (SEM) techniques. The results reported by both authors regarding the significance of field of education, needed also to be taken with an element of caution as this variable was better assessed using a multilevel approach (Titus, 2004). Notwithstanding the limitations, these studies identified many important findings available from assessments of the LSAY data.

Similar to the LSAY data set, the AUSSE questionnaire was designed, in part, to assess the university student attrition issue (Coates, 2010). The advantage of AUSSE was that it began surveying students after they first entered university, thus sampling older entrants as well as school leavers. In the first major investigation of university student attrition using the AUSSE data from the 2007 to 2010 cohorts, Coates and Ranson (2011) found the institution 'narrow field of study' and 'average grades' to be the variables most strongly correlated with attrition. Other

reported factors of attrition were: people with a disability, ESB, part-time study, greater travelling time, and working hours per week over 16 hours. The strength of AUSSE was in the sample it could analyse, in this case 14,300 first year students. AUSSE however had several purposes other than assessing retention when it was designed and could be considered as a secondary data source, which could not address specific investigation needs.

Another ACER study, which did produce its own questionnaire and was able to survey 4,400 students across 14 universities, was that of Long, Ferrier and Heagney (2006). In an effort to make general conclusions, universities were selected in this study to represent all known university types in Australia. Similar to previous ACER investigations Long et al (2006) used logistic regression to assess significant factors of attrition across the spectrum of university types. Results showed that a combination of factors was usually involved when a student had decided to withdraw from university study. Variables found to predict attrition connected to this study included: age, outside work, SES background, entering with a VET qualification, enrolling part-time, having had a preference to study in a different course or at a different university before starting. Long et al (2006) also noted that students tended to transfer, if they did so, to a university that students perceived to be more prestigious. One limitation of the data in this study, consistent with other attrition studies involving surveys, was the low response rate from students who had dropped out.

### 2.2.3 Institutional studies

Individual universities have also investigated their own attrition rates. Many such studies have been based at universities with a diversified student body (Gabb et al., 2006) and, with regards to the student groups investigated in this study, several past institutional studies have had a focus on VET entrant attrition.

Milne, Glaisher and Keating (2006) in a qualitative study on such students at Victoria University, a recognized dual sector university, found several themes emerging from some 194 semi-structured interviews conducted in 2005 and 2006. Several of these themes were relevant to this thesis' hypothesized factors of attrition. Students who reported having intentions to withdraw often reported that they needed excessive amounts of effort for their university studies. Many students also found it necessary to reduce their paid work if they wanted to succeed at the university. Some were also anxious to receive help with their finances. With regard to peers, at

Victoria University VET entrants recognized the presence of other former VET students. Indeed, many preferred VET peers to interact with, in social situations. For some of these students, namely their VET peers were their key academic source of advice. Some even reported forming informal study groups with their VET peers. Conversely, many students reported lower levels of peer support than had been the case during their prior VET studies. A substantial minority of these students went further and reported isolation issues. Credit for past studies was a major issue emerging from both this study and another qualitative investigation that focused on VET entrants.

Keating, Davies and Holden (2006) reported that students were often not aware of transfer credit opportunities. Students who were interviewed complained of inadequate counselling leading to curriculum overlaps. Similarly, Milne and Gabb (2007) reported students, who were not given appropriate credit, complaining about 'repeating concepts' and 'wasting time'. On the other hand, there were also negative issues with the receipt of too much credit. In particular, both studies reported if VET entrants skipped their first year because of credit, they found it difficult to join pre-formed friendship groups. Keating et al (2006) also noted that older VET entrants had higher expectations than younger school leavers, but had more problems with balancing other life issues. Both sets of researchers also interviewed lecturing staff, who were generally unaware of VET entrants being present in their courses. Lecturers also generally reported that it was difficult to get any information about students' prior schooling. A minority of lecturing staff, who said that they were aware, expressed mixed views with regards to 'VET entrant' abilities.

Wheelahan (2005) investigated average GPAs and retention rates for domestic students entering Griffith University, a university with a number of regional campuses across two Australian states. Her investigations focussed on the basis of admission and on how these different sets of students fared between 2002 and 2004. Wheelahan found that students entering Griffith University on the basis of a complete VET qualification performed better, on average, and persisted, on average, at a better rate than students entering on the basis of an incomplete VET qualification. VET completers, who were 'VET entrants' in Wheelahan's study, performed as well and persisted at similar and sometimes better rates than school leavers, the 'majority' group at this university.

In an institutional study at the University of Canberra, Cram and Watson (2008) collected student enrolment data to identify patterns of participation, success rates and retention rates among VET entrants who had entered through pathways with a local TAFE VET college. Cram and Watson (2008) concluded that pathways specifically developed through trans-sectoral collaboration in curriculum design were the most successful in terms of student performance and retention. However, an interesting finding was that VET entrants performed the best and persisted at a greater average rate when enrolled in pathways that had the largest VET entrant numbers. The pathways that attracted the least VET entrant enrolments were the ones that resulted in academic performance and retention rates that were below the university average. This trend remained unnoticed and might have been influenced, in some part at least, by the size of the VET entrant peer group, at the program level. Conclusions from this and most other institutional reports needed to be taken cautiously. Such studies were generally not peer reviewed and conclusions were often based on descriptive data where multivariate and chance events could not be statistically accounted for. Educational researchers had also warned against the dangers of disaggregating data and possible misinterpretation of results (Darmawan, 2003; Snijders & Bosker, 1999).

A quantitative study confirmed the importance of receiving credit for past studies in student attrition. Deng, Lu and Cao (2007) examined a number of possible factors of attrition available from university records. They reviewed the records of over 9,000 students enrolled in the Faculty of Business, one of four faculties, at the University of South Australia for 2005. Variables found to be associated with higher attrition rates were: being a first year student, and, surprisingly, being a high school entrant. It was also found that students receiving credit were less likely to drop out. Of interest were also factors not found to have a significant impact on attrition. In contrast to previous research, being part-time or being a VET entrant was not associated with higher attrition rates. However, some of these contrasting results might have been partly due to enrolment group sizes. Part-time students could not have been considered as a minority group in this context, as they made up almost half of the student population in this faculty. Conversely, the unusual higher attrition rates associated with high school entrants might have been due, in part, to the relatively lower proportion (20%) of the high school entrant group in this faculty. The VET entrants also comprised a much larger proportion (than those reported for the university in this investigation) of the student population making up around 14 per cent of the total domestic student population in this faculty. These larger, faculty level, VET entrant peer group sizes might have explained, in

part, the lower attrition rates for this group of students. The study also did not take into account two important variables often associated with attrition: academic performance (ATAR and GPA) and being an international or domestic student (Australian Government, 2004; J McMillan, 2011). As with much other Australian research on the topic, statistical analysis was limited to logistic regression, which was limited in accurately assessing indirect impacts and those coming from the faculty level factors.

In a study based at Griffith University, Simeoni (2009) showed that large retention rate differences could occur between similar single degree and double degree programs within a faculty. Simeoni surveyed 130 first year students entering a single degree (Bachelor of Exercise Science) and a double degree (Bachelor of Exercise Science/Physiotherapy) within the health faculty between 2003 and 2008. An analysis of factors associated with 'ease of transition' found that a 'sense of community' in terms of having friends for social and academic support was consistently reported as having a positive influence on a student's transition to university life. Large differences were noted between retention rates for students taking either the single or double degree options. Differences in retention rates seemed to be associated with cut off entry scores for the two types of program and accordingly with students' average high school entry scores (ATAR or Overall Position rankings, as it was known at the time in this Queensland university campus). Another apparent factor was that the single degree option was admitting large numbers resulting in extremely large class sizes of over 600 students. This seemed to have negative effects on student persistence within these classes. Conclusions from this study needed to be taken with caution since little or no statistical analyses were performed with regards to statistical significance.

In a qualitative study, Devlin and O'Shea (2011) interviewed 53 low SES, domestic students who had enrolled at a regional campus of a Victorian university with a diverse student body. The authors purposely selected students who had been able to persist through to the second year of studies. They found that students' attitudes and behaviours were the most influential for students' successes. In relation to this study's propositions, it was found that time management and study efficiency were important for success. Students also reported that having a study group or a study partner helped overcome academic issues. These findings indicated that academic efficiencies and student networks were both influential for persistence to the second year of university.

In a recent published article, Harvey and Szalkowicz (2015) used a mixed method approach drawing quantitative and qualitative data from two institutional reports at an Australian university. Findings based on institutional data and 317 interviews and 10 focus groups showed that students often left for personal reasons, were young and from under-represented groups of the population. A separate analysis within the Bachelor of Arts program found that students with lower ATAR scores were more at risk of attrition. Students who had not chosen this program as their first preference were also more likely to drop out. Forming social bonds was also a consistent factor of attrition with almost all withdrawn students confirming challenges with making friends in focus group discussions.

There were a number of limitations to the Australian research on university student attrition. Consistent with studies in other parts of the world, there have often been difficulties in collecting data on student attrition. This was aptly demonstrated in an institutional study at Victoria University (Milne & Gabb, 2007). While 158 students completed an introductory survey, only 86 gave permission to use university data. While 16 students gave interviews, where qualitative data could be extracted, none of these students had actually dropped out. No withdrawn student had consented to be interviewed. While some evidence was gathered, not enough quantitative data was collected to show any significant results nor was any conclusive qualitative evidence gained due to the complete lack of participation from the very students who had dropped out.

Australian studies on attrition and retention have also tended to use descriptive statistics or limited statistical methods for their analyses. Aird et al (2010) had noted that many Australian studies had been funded by government sources or individual institutions and had not undergone a rigorous reviewing process. Thus, Australian research, while informing this current study on the possible inclusion of a number of different variables as possible factors influencing student attrition, has provided limited information on the complexity of the student attrition issue. Furthermore, this study sets out to provide distinct paths of influence including mediating and moderating effects coming from student level variables, and direct and interaction effects coming from program and faculty level factors, the Australian studies described thus far have not used path analysis, nor structural equation modelling, nor a multilevel approach to analyse the student attrition problem.

## 2.3 Review of past studies on attrition in international contexts

There are numerous studies focusing on university student attrition. Thus, any review of the topic has to be selective, and is, most likely, to be structured to support a particular view. In an effort to widen the scope of studies covered, this chapter section refers to a number of key review papers. This part of the review of the international studies emphasizes several major stages of methodological development that have led to the use of Path Analysis, Structural Equation Modelling and multilevel Hierarchical Linear Modelling.

From the very early studies, the multivariate nature of the student 'Drop Out' issue has been recognized and in the early studies, much of the reporting was done using mainly descriptive statistics. With the advent of path analytical techniques, the indirect effects of mediating variables have been assessed more accurately. The substantial impact of Tinto's work, and to a lesser extent that of Spady, is recognized with large parts of this review dedicated to researchers' studies assessing Tinto's model of student attrition. A number of theoretical models emphasizing direct and indirect effects on student drop out are described including that of Tinto's with emphasis placed on studies using path analysis or structural equation modelling techniques. A section of this part of the review of international research studies focuses on a variable often mentioned but rarely considered; 'peer group size'. The final section of the international review of studies deals with a small number of more recent studies that emphasize multilevel methods that can assess peer group sizes, as having a distinct influence on student attrition.

### 2.3.1 Early studies using descriptive statistics

In the English-speaking world, university student attrition and retention has been a topic of academic study for approximately a century. Completion rates, which are a direct result of student retention, have been assessed in the US for over 100 years. Tinto (1982) reported that in the period between 1880 and 1980, US aggregate completion rates remained remarkably stable at around 45 per cent. The only time that this was not the case were the periods immediately before and after the Second World War.

Summerskill's (1962) detailed review of the US academic investigations on the topic of student attrition cited scholarly studies dating back to the cohort of students entering US universities in

1913. Another very early citation was made by McNeely (McNeely, 1937) of a study by Harold A. Edgerton and Herbert A. Toops, which investigated student attrition, or mortality rates as they were known at the time, at the Ohio State University in 1929.

McNeely's (1937) investigation, was the first major US government study designed to assess the 'student mortality' problem. The study compiled survey results that involved 15,535 students, across 25 universities throughout the US. The compilation, which tracked the 1931-32 cohort of entrants and investigated attrition for a period of four years following the initial enrolment, was a detailed assessment which has stood the test of time in its scope and intuitive identification of possible factors influencing attrition. As well as asking students directly for reasons for leaving university, the surveys collected information on variables which were thought to be influential to 'student mortality'. Among these were: gender; age; distance from home; place of lodging; credit hours; and academic marks. While McNeely's study was confined to using descriptive statistics to show trends, many of these student level variables have since been shown to be significant factors influencing attrition in a number of subsequent studies. McNeely's study also assessed institution level variables, such as size of the college, and whether attrition rates differed between different schools within universities. McNeely's findings which have since become basic tenets were: (a) most attrition occurs in the first year, and (b) a student's grade point average has a major causal relationship to attrition. The study also distinguished between students transferring to other universities as well as those withdrawing temporarily before returning at a later stage. Also, in relation to this current study's multilevel approach to viewing student attrition, another important finding was that the different institutions and programs had substantially different attrition rates. Namely, 'arts and sciences' school attrition rates, assessed over four years, were found to be roughly twice as high as the attrition rates of 'law' schools.

Soon after McNeely's pivotal study came the Second World War and a time of great upheaval. In the US, the G.I. Bill, introduced in 1944, helped returning soldiers to study at university. There was a rapid expansion of university enrolments with many universities filled to capacity (Berger, Ramirez, & Lyons, 2012). Motivation to stay at university and get a university education seemed to greatly influence university retention rates (Berger et al., 2012; Tinto, 1982).

Following the Second World War, a second major U.S. government survey study was conducted to investigate the attrition issue. Directed by Iffert (1958), the study involved 149 institutions



across the US. 12,667 students were surveyed who had first enrolled in 1950 at a variety of universities, technological institutions, liberal arts colleges, teachers' colleges and junior colleges (2-year institutions). Relying exclusively on descriptive statistics, Iffert confirmed many of McNeely's (1937) earlier findings, including the correlation between academic performance and student retention, and that most attrition (about half) occurred during the first year of enrolment. In terms of academic performance, Iffert found that the chances of persisting past the first year and graduating were both improved if a student had gained a higher high school rank, before entering, and a better cumulative grade point average, after entering the institution. Iffert also looked at several class level variables including subject fields at time of entry, and class sizes. In terms of subject field, those subjects that were occupational in nature were those with better retention rates. The connections between class sizes and attrition were unclear, but students did report a higher level of dissatisfaction with large class sizes. An additional factor concerning social peer groupings was examined. Iffert found that universities where fraternities and sororities were recognized had better retention rates than the universities where such membership groups did not officially exist. Here was one of the first described instances that seemed to indicate a relationship between peer groupings and student attrition, a central issue in this current study.

This second coordinated government survey, like the first, assessed institution level factors. Iffert found that more selective private universities had aggregate attrition rates appreciably lower than those at public universities. Iffert surmised that the higher rate of attrition was due to the public institutions being obliged to accept a wider range of students, with respect to high school rankings and financial standing. This second government survey also began to investigate motivational reasons for dropping out. Iffert found conflicting results with regard to motivation and concluded that a more specialized survey instrument was needed to better assess this idea of attrition and retention.

Iffert's and McNeely's reports were two out of the 35 scholarly studies reviewed by John Summerskill in 1962. Indeed Summerskill was recognized as being the first to emphasize the multifactorial nature of a student's decision to drop out of university (Morrison & Silverman, 2012). Summerskill (1962) was also the first researcher to skilfully overview the many factors through a number of theoretical perspectives. He even looked at the biological aspect of the issue in his review of studies examining the effects of age and gender. It is, however, in his psychological view where the most insightful thoughts were discussed. After accounting for

around a third of attrition being a result of inadequate academic aptitude, he hypothesized the main predictor of a student dropping out to be 'motivation', and more importantly a specific motivation to study at a particular college. Summerskill (1962) stated that "it is inadequate to ask if a student has sufficient and appropriate motivation for college. The more meaningful question is: does the student have sufficient and appropriate motivation for a specified college with specified characteristics and objectives" (p. 640). This 'motivation' for a specific institution has subsequently become a central factor influencing student attrition in numerous subsequent studies. 'Institutional Commitment' as it has been named has often been assessed as the strongest predictor of university student attrition. Summerskill concluded by advocating for future studies to use appropriate and consistent ways of 'operationalizing' this construct. Consistency in operationalizing this and other conceptual ideas associated with attrition has however been difficult to achieve (Tinto, 2012).

### 2.3.2 The Spady and Tinto models of student attrition

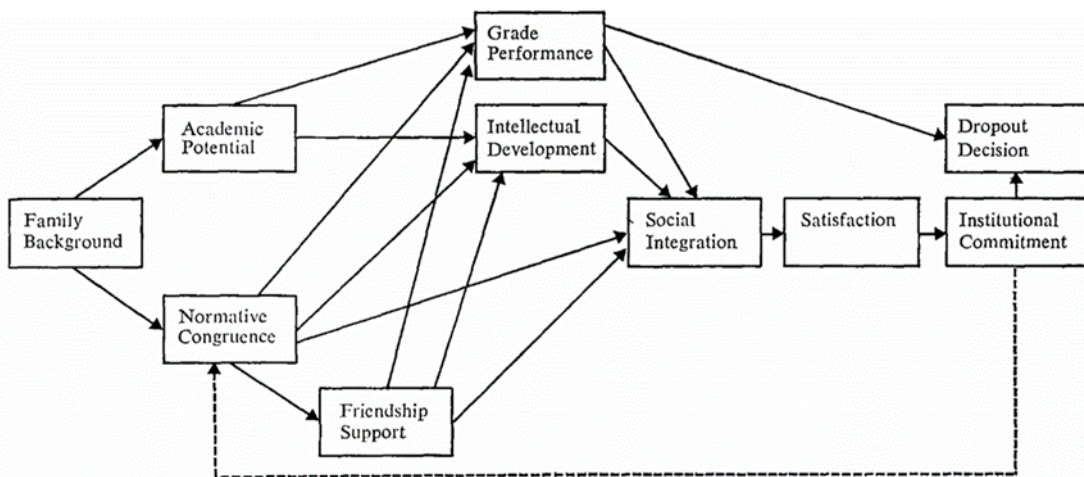
Spady (1970, 1971) was the first to put forward an empirical model (Figure 2.1) which incorporated multiple causes of attrition including Summerskill's (1962) motivational notion of institutional commitment. In his first of two key articles, Spady described his new model based on Durkheim's concept of social integration (as cited in Spady, 1970, p. 78): that each student entered a university with a set of dispositions, interests, expectations, goals and values shaped by family experiences. Spady (1970, 1971) grouped these together under the term 'normative congruence'. Normative congruence, together with friendship support, was proposed to lead to social integration. In Spady's model students' social role overlapped their academic role. Thus, friendship support, importantly for the purposes of this current study, together with the student's academic aptitude and normative congruence was postulated to influence intellectual development and academic performance. Within the model, success in meeting the academic and social demands led to satisfaction, which in turn directly linked to institutional commitment. Finally, the student's institutional commitment and academic performance were hypothesized to directly influence the dropout decision.

While Spady's (1970, 1971) model was logical and largely testable at the time, it also embodied some questionable aspects. Its theoretical basis was tenuous. Durkheim's theory was based on an individual's decision of whether or not to commit suicide, a rather more desperate outcome than dropping out of university. A desperate outcome might require more desperate means, and

possibly more irrational processes when making decisions. Within the model itself there were several links which raised suspicion. Academic potential was hypothesized to be the direct result of family background alone.

On first impressions, the link suggested that a student's potential was based on genetics alone. A closer inspection of Spady's (1971) operationalization of family background, however, seemed to indicate that this concept was very, if not too, broad. It included religious-ethnic origin, degree of urbanization of where the family lived, father's education and occupation, mother's education, parental marital stability, home life happiness, perceived freedom, and independence in the home environment. Similar comments of oversimplification can be made about the above-mentioned normative congruence construct. The use of broad concepts, empirically measured using a disparate set of items, was common in this field of studies. Spady's (1971) model also showed a lack of understanding of the temporal, longitudinal nature of the issue. The model was cyclical with institutional commitment hypothesized to influence, and to be influenced by, a student's normative congruence (see Figure 2.1).

Nevertheless, Spady's work, itself, was very influential in the development of Tinto's subsequent model of attrition.



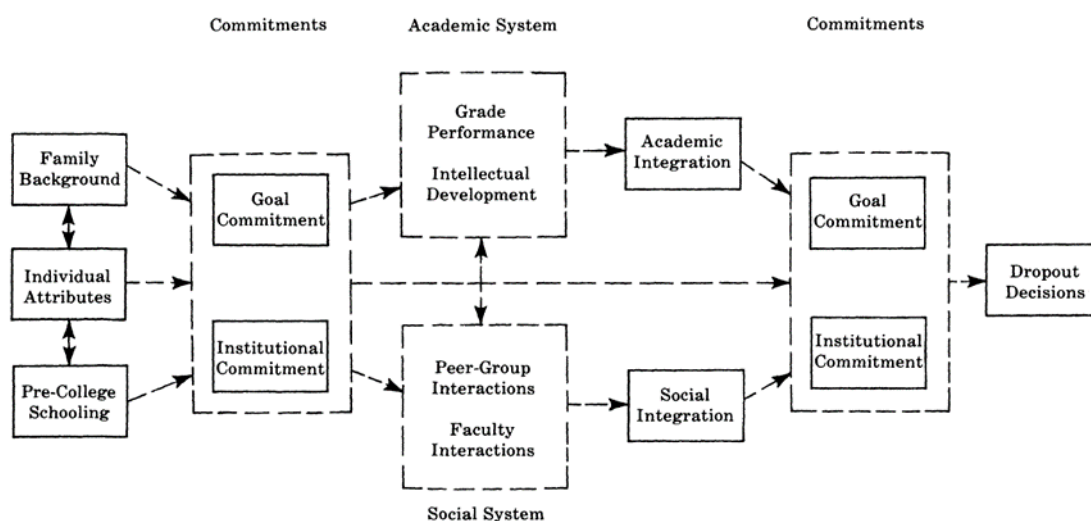
**Figure 2.1 The 'Spady' model of student attrition**

'A theoretically based model of the undergraduate dropout process' (Spady, 1971, p. 39).

A few years after Spady's model was published, Tinto (1975) published his own model of student attrition (Figure 2.2). The model, or conceptual schema for drop out from college, had some important features. First, it was clearly longitudinal. Tinto hypothesized that students entered the

US college with commitments that had been influenced by family background, individual attributes, and pre-college schooling experiences. He delineated between the specific, institutional commitment and the more general, goal commitment, which were defined as the general motivation to get a college education. Both of these commitments, Tinto postulated, influenced the way a student interacted with both social and academic systems of the institution. The academic interactions included the student's intellectual development and academic performance, while social interactions included those with peers and with faculty teaching staff. These student-institution interactions were hypothesized to lead to a student's academic and social integration within the college, which in turn led to an adjustment of the student's institutional and goal commitments. These temporally 'later' commitments were hypothesized to influence directly a student's decision to either persist or drop out of college.

This model had a major impact on this field of study. Various researchers began to operationalize and test the model and offer improvements. Tinto himself continued in his quest to hypothesize a better model. In 1987, he published the first edition of a book on the topic, and in 1993 a revised second edition.



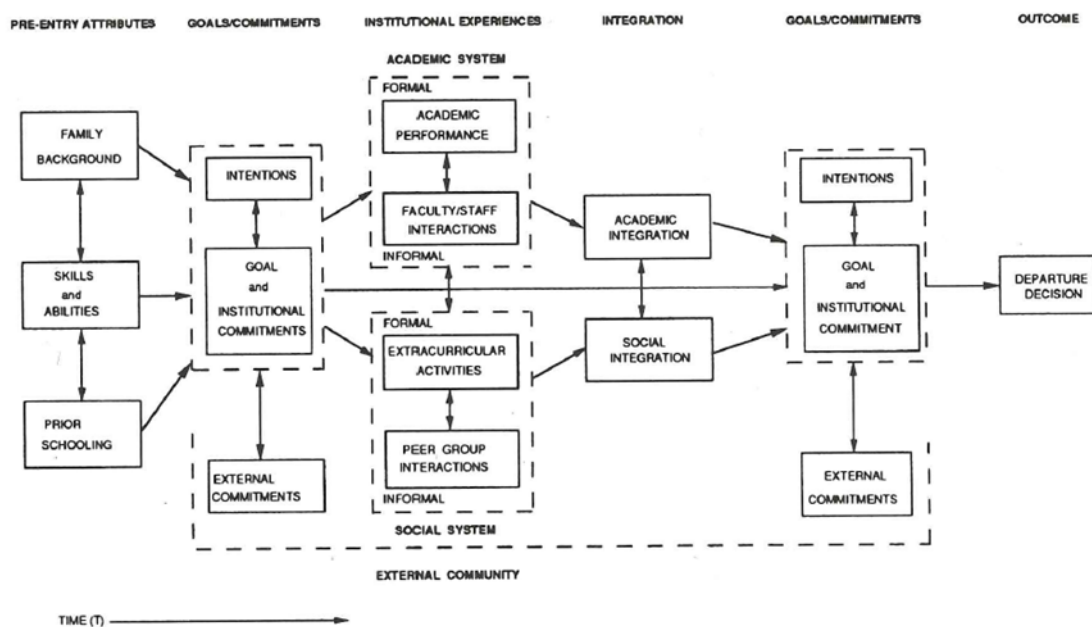
**Figure 2.2 The first 'Tinto' model of student attrition**

'A conceptual schema for dropout from college' (Tinto, 1975, p. 95).

While Tinto's 1975 model was the one which has been tested the most (Braxton et al., 2014), his 'longitudinal model of institutional departure' (Figure 2.3) published in the 1993 edition of his seminal book 'Leaving College: rethinking the causes and cures of student attrition' is, to date, the most cited in the academic field. A google scholar search on 'theoretical model of student attrition' performed at the time of writing returned 9,855 scholarly citations for Tinto's 1993

reference. The next most cited model, Bean and Metzger's (1985) model of non-traditional student attrition, was a distant second with 1,815 citations. Tinto's seminal work (1975, 1993) has been given near paradigmatic status (Braxton et al., 2014; Gabb et al., 2006; Yorke & Longden, 2004).

Conceptually, Tinto's (1993) later model (Figure 2.3) included a student's intentions as part of the commitments. A student's intention to either persist or withdraw had been shown to be a strong predictor of the drop out decision (Bean, 1982; Cabrera, Castaneda, Nora, & Hengstler, 1992). The revised model also included commitments external to the institution, as influencing the overall internal commitments to remain at the college. Thus, commitments such as to work or to family were now also included and hypothesized to influence the drop out decision.



**Figure 2.3 Tinto's longitudinal model of institutional departure**

Tinto's updated model of college student attrition (Tinto, 1993, p. 114).

It is difficult to pinpoint reasons why Tinto inspired such academic interest. His model is like many of his contemporaries based mainly on psycho-sociological concepts. Tinto's model was often viewed as an enhancement of the Spady (1971) model. Like Spady's, Tinto's model was based on Durkheim's theories of the 'suicide decision'. Tinto, also like Spady, viewed the process of becoming socially integrated into the college culture as central to maintaining a commitment to persist at the college. Additionally, he used Van Gennep's theories of how tribal members progressed through to adulthood in order to hypothesize that students needed to go through three separate stages: separation (from their past high school or familial communities); transition

(between the two communities); and incorporation (into the college community). These processes helped to introduce a longitudinal nature to a theoretical model for the first time, showing commitments to remain at college that were constantly changing as a student interacted and integrated with the college environment.

Tinto was also one of the first to introduce the concept of academic integration within the college student attrition context. This variable he placed centrally in his model. Academic performance was only hypothesized to have an indirect influence on the decision to persist, through academic integration and institutional and goal commitment. It seemed that Tinto was trying to minimize the effect of academic performance in his quest to focus his explanations to students who had voluntarily dropped out of college. Students who had been asked to leave on the grounds of poor academic performance were purposely not included in his model (Tinto, 1993, p. 112). In any case, academic performance was overlooked in all of Tinto's models of the time, and, subsequently created some confusion in later studies that tried to operationalize Tinto's concepts. At times, students' Grade Point Averages (GPAs) were measured and incorporated as a component of 'academic integration' (Cabrera, Castaneda, et al., 1992; Pascarella & Chapman, 1983a; Pascarella & Terenzini, 1983), or relegated to a background variable to be controlled for (Pascarella & Terenzini, 1980) or essentially not even considered (Berger & Braxton, 1998; Bers & Smith, 1991). Unlike Spady, Tinto and his followers seemed to dismiss past empirical evidence which showed that the first semester Grade Point Average (GPA) was often the strongest predictor of attrition (Pantages & Creedon, 1978; Summerskill, 1962).

Tinto himself was circumspect when defending his own model. In his 1993 book, he stressed that his model was intended to be very specific in its use and sought to explain only voluntary institutional attrition as opposed to system attrition. Later he added that the model was constructed with only 'majority' students at 'residential' universities in mind (Tinto, 2006) and therefore possibly unsuitable for other contexts. There is no denying the impact that Tinto has had on the field of study. Judging by the number of studies assessing it as a whole or in parts, as described in the next section of this review, the model was undoubtedly testable and clear in its causal links and longitudinal nature. It also was aimed to be useful for institutional changes to take place, so as to improve the situation (Tinto, 1993, p. 113). It seemed to be the right 'model' at the right time. It seemed that Tinto had constructed a model that was suited to being assessed

by a statistical technique that was gaining in popularity with many educational researchers at the time, namely, path analysis.

### 2.3.3 Studies testing Tinto's model and the use of path analysis

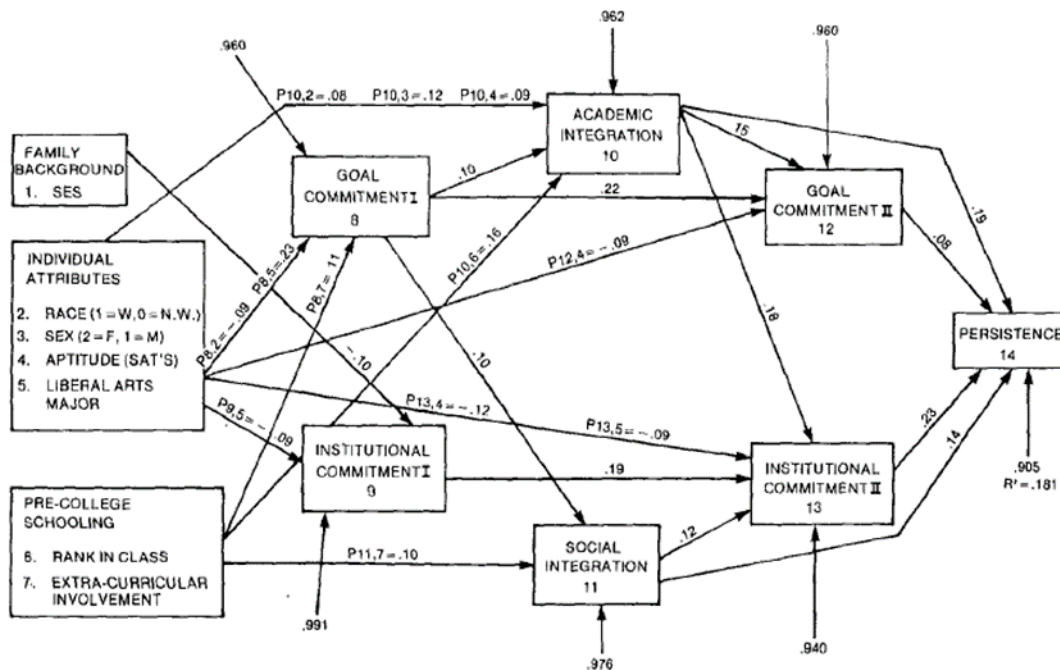
Shortly after the publication of Tinto's first model of attrition, a number of educational researchers began to find ways of testing the model. Armed with statistical techniques for handling multivariate problems, Ernest Pascarella and Patrick Terenzini conducted numerous studies aiming to assess the utility of the Tinto model.

One salient investigation was carried out at a residential university in the state of New York by Pascarella and Terenzini (1979, 1980). The study focused on testing the direct and interaction effects of Tinto's social and academic integration with other variables, in the prediction of voluntary student withdrawal at the institution. The pair designed a 34-item survey instrument, which was administered to a sample of students that had previously responded to a questionnaire gathering student background information. A principal component analysis performed on the 763 (10 were removed as they had been forced out on poor academic performance) survey responses revealed a five component structure. The authors then conceptually combined these components to form Tinto's social and academic integration and institutional commitment. They added first semester GPA, obtained from university records, as an extra component of the academic integration construct. Other variables were obtained from university records and used in the analyses as separate variables. These included each student's: gender; ethnic minority; entrance high school rank; Scholastic Aptitude Test (SAT) score; preference for type of program (split into liberal arts and professional); and the student's rank of the university as college choice (1st to 4th). This latter variable was used as a measure for Tinto's initial 'institutional commitment' concept.

The authors employed two group discriminant function analyses, which they referred to as a form of multiple regression with a dichotomous dependent variable, to assess the interaction and direct effects of the tested variables on the dependent variable of student voluntary withdrawal from the university. The results indicated both strengths and weaknesses of the Tinto and Spady models. The students' entering characteristics and first year social and academic integration explained 37 per cent and 31 per cent of the variance in first year male and female persistence respectively. When multiplicative terms, assessing the influence of different dimensions of social

and academic integration for different kinds of students, were added, the explained variance increased by 11 per cent for men and by 25 per cent for women. Pascarella and Terenzini (1979) concluded that the college student attrition problem was 'a particularly complex pattern of socio-psychological relationships' (p. 208), and that in order to get a better understanding, investigations needed to take into account the interactions between variables, in any model.

Pascarella and Terenzini (1983) employed the same sample in an attempt to take their own advice. This time they used path analysis to examine the situation. The advantages of the path analytical techniques is the capacity to assess both direct and indirect effects on the student outcome variable (Tuijnman & Keeves, 1997). Pascarella and Terenzini (1983) employed multiple regression analyses to build and examine a parsimonious or 'reduced' path model which retained only those paths that were found to be significant. This reduced path model is shown in Figure 2.4.



**Figure 2.4 Pascarella and Terenzini's path model of student attrition**

The reduced path model of student persistence based on Tinto's 1975 model (Pascarella & Terenzini, 1983, p. 221).

Conclusions made from this revised study were that Tinto's model was adequately predictive. Two results need specific mention. First, none of the background characteristics or initial commitment variables had a direct influence on persistence (see Figure 2.4). Rather, their effects



were indirect, operating through social and academic integration or subsequent institutional and goal commitments, making path analysis particularly appropriate as a technique for examining the problem. Secondly, the total variance explained of the dependent variable, namely persistence, by the reduced model was moderate at around 20 per cent. The authors noted that such percentages were consistent with the results of much attrition research of the time. Pascarella and Terenzini were recognized by subsequent researchers for their efforts to develop and operationalize many of Tinto's concepts, including social integration and institutional commitment, which had not been as well defined by Tinto (Bers & Smith, 1991; Braxton et al., 2004; Cabrera, Nora, & Castaneda, 1992).

A number of studies sought to aggregate data across different institutions, in order to make estimates that could be generalized to the college population as a whole. In one of the first attempts to do so, Munro (1981) drew over 6,000 participants from a US nationwide longitudinal survey (NLS). Munro assessed the effects of a number of variables on institutional persistence and system persistence with the same path analytic method as that employed by Pascarella and Terenzini (1983). Munro was unable to find any significant effects on institutional persistence but found significant positive effects on system persistence from academic integration, high school grades and goal commitment. With respect to persistence, the proportion of the total variance explained by the variables in the reduced model was moderate at 14 per cent. However, as the study combined data sets and treated them as a single group, Munro could not take into account any specific institutional level effects.

Pascarella and Chapman (1983a, 1983b) tested the Tinto model across 11 institutions and attempted to take institutional attributes into consideration by asking students if they resided within the institution. Like Pascarella and Terenzini (1983), they used path analyses to produce 'reduced' models for different types of institution (1983a). They concluded that social integration was the more predictive variable in residential universities while academic integration was more predictive in commuter (both four year and two year) institutions. This finding was not surprising as social dynamics would have been far more important when students resided within the university or college community. Whereas, when students lived outside the institution and only came to it for study purposes, 'academic integration', which included academic grade performance, was more likely to be influential for a student's persistence. The variance explained by the reduced models for the different institution types ranged from 13 per cent to 17 per cent,

and were similar in magnitude to the explained variances reported for Munro's (1981) models. It can be noted that Pascarella and Chapman's academic integration was a composite using a seemingly disparate set of components such as: first term GPA, academic effort, informal contact with academic staff, and participation in career planning. Thus comparisons between studies such as this and that of Munro (1981), who used only two components for his academic integration construct, must be taken with an element of caution.

Subsequently, Pascarella, (1985) used a large secondary data sample of over 5,000 students from 352, four-year colleges to investigate racial differences in factors associated with undergraduate degree completion, rather than attrition, using the Tinto model. The investigation drew the sample from the 1971-1980 Cooperative Institutional Research Program (CIRP) study, which surveyed students nationally across the US. From the CIRP survey items, Pascarella operationalized 19 variables loosely connected to the Tinto model, including: social integration; academic integration; and institutional commitment. Variables tested also included those at different levels. A pseudo-faculty level measure called 'expected major' was employed as a dichotomous variable (liberal arts/science or pre-professional). Three institutional level variables were also included: institution size, selectivity/prestige, and predominant race. Results showed that black men were negatively influenced by institution size. The author's explanation for this result is particularly salient. Pascarella (1985) stated:

"it [institution size] may be particularly deleterious for campus minority groups such as black men. Because they are represented on the large campus in such small relative numbers, it may be especially difficult for such individuals to locate and join the types of peer subgroups that will enhance their individual integration into the institution's social environment..... Consequently, they may be more likely to withdraw from such institutions." (p. 368).

If this is to be accepted as a plausible explanation for minority group attrition, then 'peer group size' at the institution level, and possibly at the program level, seemed to be having effects on student attrition. Conceptually, peer group size increases at the institution level are a consequence of such increases at the program level. As these minority group sizes increase, there are more chances of finding minority peer subgroups that can facilitate a minority student's ability to integrate socially.

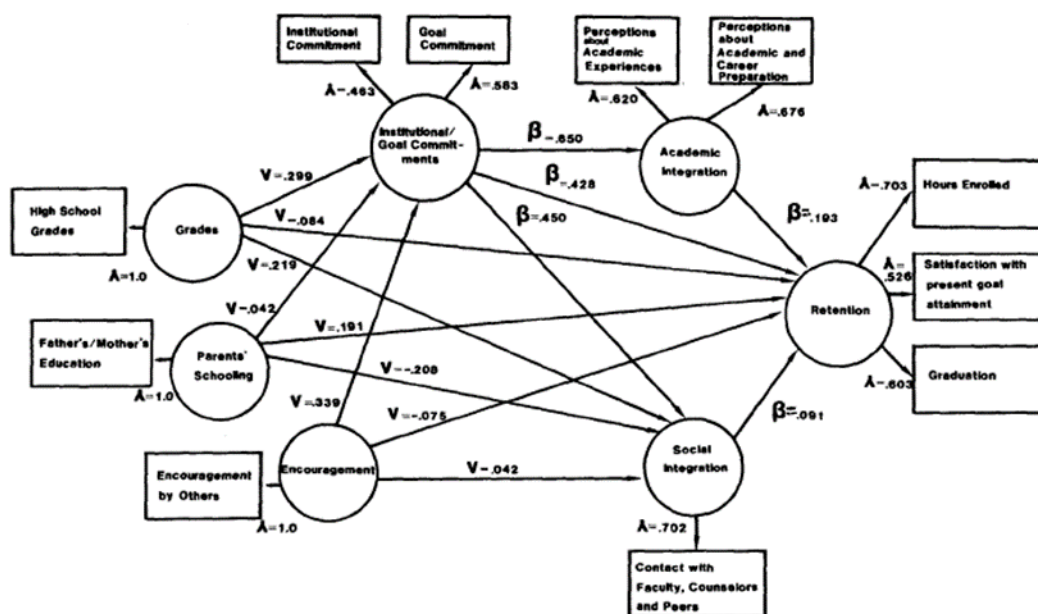
Pascarella's results, however, need to be viewed with caution. Pascarella was restricted to measuring social integration, as well as other variables, from secondary data, namely items which had been designed for the CIRP survey, which he himself described as 'not tapping the full range of the depth of the [social integration] concept'. The six items used had low internal reliability (alpha reliability = 0.58) and were very different from those used in other studies.

More importantly, Pascarella used largely inadequate statistical analyses. He adopted 'single level' least squares regression analyses to draw his conclusions. As recognized by the author, this method worked best when the dependent variable was of a continuous nature. Degree completion, the dependent variable in this study, was dichotomous in nature, with each student being coded as either having completed or not having completed a

Bachelor's degree. Regression analyses also could not properly assess the effects of higher level variables such as the one faculty level and three institution level variables addressed by the study (Titus, 2004). Notwithstanding these limitations, the variables operationalizing the constructs of Tinto's model were associated with modest amounts of variance: 20 per cent and 29 per cent of the variance in degree completion for white and black men, respectively; and 15 per cent and 17 per cent of the variation in degree completion for white and black women.

In a salient study illustrating the use of more methodologically advanced techniques, Nora (1987) tested the appropriateness of the Tinto model to explain college retention of another large racial minority group found in the US, namely the Hispanic students coming from Latin America. In this study, retention (the opposite of attrition) was constructed using three separate indicators and was measured over a longer period of four years. In order to assess Nora's version of the Tinto model, a sample of 227 Hispanic students was surveyed from three public two-year community colleges in southern Texas. Seven variables were used in its assessment: two background variables, social and academic integration, institutional commitment, encouragement (not a Tinto construct), and retention. In order to assess the model, Nora used a form of structural equation modelling (SEM), by employing the LISREL IV computer program to simultaneously analyse the effects of the different variables on student retention.

SEM is a method of analysis that is important to and is used in this current investigation, so that the particular features that were evident in Nora's study are also relevant throughout the rest of this review of past studies and throughout later chapters.



**Figure 2.5 Nora's SEM model of student retention**

The full statistical model (Nora, 1987, p. 50).

Of interest in Nora's final model was the higher than expected influence on retention of the assessed 'initial' institutional commitment and the lower than expected influence of the academic and social integration constructs. These results may have been a consequence of the different ways the Hispanic minority groups were influenced by the Tinto concepts. However, once again, the concepts themselves had not been measured comparably with previous studies. For example, academic integration, in this case, did not include GPA or a similar measure of academic performance. This may have weakened its effect on retention, itself measured in a different manner to the 'standard' first year retention or attrition. In Nora's study, retention was measured over four years, as a latent variable, indicated by three measured observed variables. Whereas, usually, it had been measured over one year as a single observed variable. Thus comparisons with other studies on attrition are difficult to make.

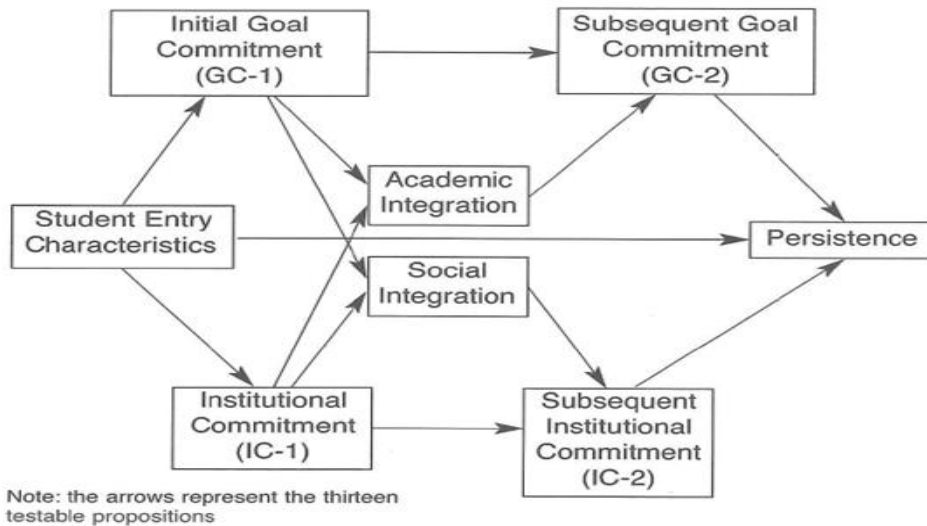
Another limitation of the study was the way it considered institutional effects. The participants for this study came from three separate institutions but were examined as one group in the analysis. Nora tried to minimize any institutional effect by selecting institutions that were similar in a

number of aspects: including enrolment patterns and geographical position (they were all in Texas and enrolled a large proportion of Hispanics). This type of analysis was still likely to face aggregation bias issues (Darmawan, 2003; Snijders & Bosker, 1999). If students differed on one or more of the measured variables because of the institution, this could not have been provided for in the calculations.

The statistical methods used to assess the model, however, were superior, in certain aspects, to the path modelling used by Pascarella and Chapman (1983a). As Nora argued, SEM's ability to provide for error measurements, allowed for a more accurate estimation of the model parameters, such as measures for the path coefficients or  $\beta$  values shown in the Figure 2.5. SEM also improved parameter estimation by being able to use multiple observed indicators to measure unobserved latent variables. SEM is based on the idea that observed items or indicator variables that covariate infer the existence of a latent variable (see Schuetz, 2008). This process further reduced inevitable measurement errors, as multiple measures were a better estimate than a single measure for any one concept. Variables in Nora's model accounted for 42 per cent of the variance of the measured retention, an improvement over previous studies referred to in this review.

Furthermore, the computer program used for the analysis, LISREL, estimated parameters and associated error measurements for the models simultaneously and produced 'goodness of fit' estimates. These 'goodness of fit' indices, were designed to assess how well the model fitted the data (Bentler & Speckart, 1981). Nora (1987) reported values for the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), and the root mean square residual (RMR). The values reported (0.920, 0.840, and 0.098 respectively) indicated that the overall fit of the model was acceptable.

Comparing earlier studies with more recent ones, Tinto's model has been the most influential in the field. John Braxton has led a number of the more recent assessments of the Tinto model. Braxton and his colleagues sought to summarize the evidence that had accumulated in the US for all of Tinto's hypothetical paths displayed in his 1975 model (Braxton et al., 2014; Braxton et al., 2004; Braxton, Sullivan, & Johnson, 1997). Tinto's model was firstly deconstructed into 13 separate hypotheses (Figure 2.6).

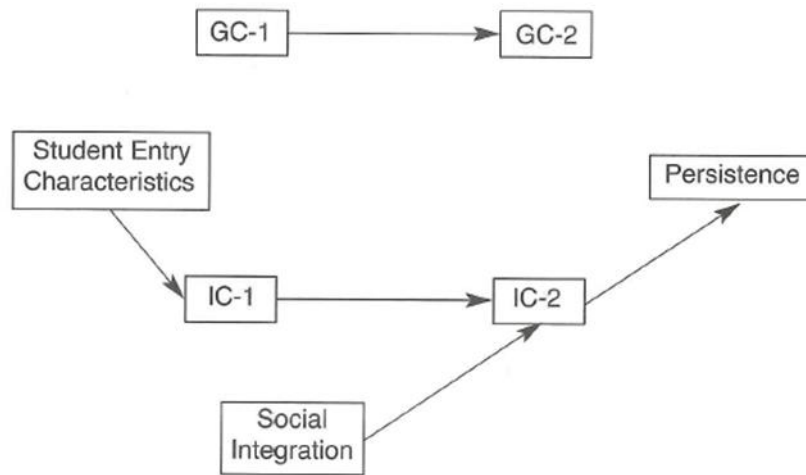


**Figure 2.6 Tinto's 13 testable propositions**

Path diagram of Tinto's interactionist mode of student persistence showing 13 testable propositions (Braxton & Hirschy, 2004, p. 90).

A meta-analytical technique was then used to assess how many of the 13 hypotheses had strong empirical agreement with past publications that had employed multivariate statistical techniques. Braxton and his colleagues concluded that five of the 13 hypotheses had strong agreement with studies that focused on 'residential' institutions. These were: the level of initial goal commitment affects the level of social integration; social integration affects subsequent institutional commitment; initial institutional commitment affects subsequent institutional commitment; initial goal commitment affects subsequent goal commitment; and subsequent institutional commitment affects student persistence (Figure 2.7).

Studies testing the model at commuter institutions, however, showed a much lower level of support. Only two of the 13 hypotheses received what Braxton and his colleagues considered as strong support: student entry characteristics affect the level of initial institutional commitment; and the level of initial institutional commitment affects the level of subsequent institutional commitment. As the university in this investigation is closest to the US 'commuter' institution, these two causal paths hypothesized by Tinto are of great interest.



Note: the arrows indicate strongly-supported propositions

**Figure 2.7 Tinto's strongly supported propositions**

Path diagram of five strongly supported propositions of Tinto's interactionist model (Braxton & Hirschy, 2004, p. 91).

A smaller number of studies have also tested the Tinto model outside of the US. Brunsden, Davies, Shevlin and Bracken (2008) tested the model using the maximum likelihood LISREL 8 program at two universities in the UK. Like in Nora's (1987) study which used an earlier version of LISREL, Brunsden and his colleagues assessed the overall fit of the model to the data as a whole. They found that the estimated paths in the model were poor predictors of student attrition at the two UK universities. They reported several goodness of fit coefficients (including GFI=0.85; RMSEA (root mean squared error of approximation)=0.85). In a study surveying 3,789 students in Ontario, Canada, Dietsche (1990) found academic integration and educational commitment to be of greater influence to persistence than social integration and institutional commitment for students at a college of applied arts and technology. Saeed (2008), in his PhD dissertation assessing the Tinto model in a Saudi Arabian university, found some support for the model (GFI= 0.88; AGFI=0.85; RMSEA =0.07). Saeed was, however, critical of the low amount of variance explained by the model estimated at 30 per cent, an amount which was seemingly comparable to explained variance reported by many similar analyses for the model in US contexts (Braxton & Hirschy, 2004).

Braxton et al (2014) noted that the Tinto model was not strongly predictive when applied to non-traditional and racial minority groups. This review, therefore, now turns to some other models of attrition which better predict student drop out for non-traditional students.

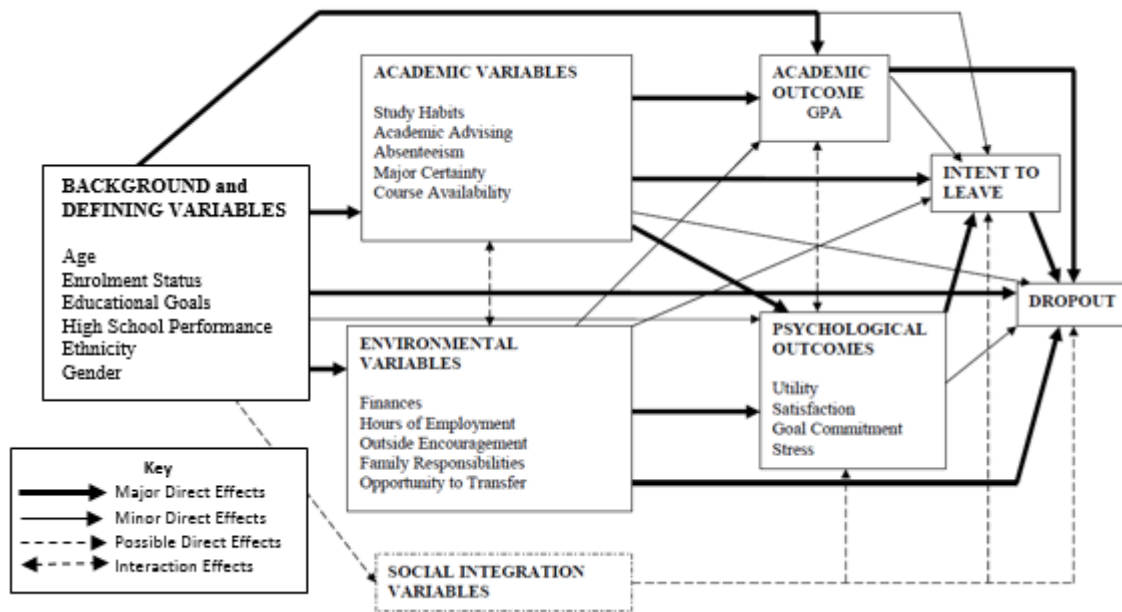
## 2.3.4 Other models of attrition

### 2.3.4.1 *The Bean and Metzger model*

Bean and Metzger (1985) developed the earliest model to explain non-traditional student attrition. Their model, as previously stated, was second only to Tinto's in number of citations received. Studies of attrition associated with the various minority groups in the field of higher education have been prevalent (Berger et al., 2012). Traditional college students were seen by Bean and Metzger, as those students who were residing on campus, 18-24 years old, and attending a university or college on a full-time basis. Thus, Bean and Metzger (1985) defined non-traditional students as being outside of these norms as well as those that may have come from ethnic minority groups of lower socio-economic status backgrounds. The rise in non-traditional enrolments, attributed partly to the rise in popularity of the vocationally focused US community colleges, involved a new model of student attrition. Non-traditional students were historically associated with higher attrition rates (see Iffert, 1958; McNeely, 1937) and Tinto's model had disregarded this type of student (Tinto, 1993). Bean and Metzger postulated their model through both an inductive approach, which closely followed past empirical evidence, and a deductive approach using a theoretical argument. The argument considered mainly psychological concepts; that involved learnt behaviour, attitudes based on experience and intentions which led to actual behaviour, in this case, to drop out of college.

Bean and Metzger's model (shown in Figure 2.8) hypothesized that non-traditional students were less influenced by levels of social integration within the college, and thus more influenced by external pressures, which they termed as 'environmental variables'. These included financial, family and employment pressures. They also hypothesized that academic performance was a stronger predictor of attrition than was the case for traditional students. Academic performance at the university was itself argued to be more strongly influenced by past high school performances. These high school performances were thought to also have a direct influence on the drop out decision. Other background variables were also hypothesized to have both direct and indirect effects, mainly through academic performance, on student attrition. These included age, enrolment status, and ethnicity. Older students, and those who were part-time students, were hypothesized to drop out at higher rates, even though age seemed to have a positive influence on academic performance.





**Figure 2.8 Bean and Metzner's model of non-traditional student attrition**  
 A conceptual model of non-traditional student attrition (Bean & Metzner, 1985, p. 491).

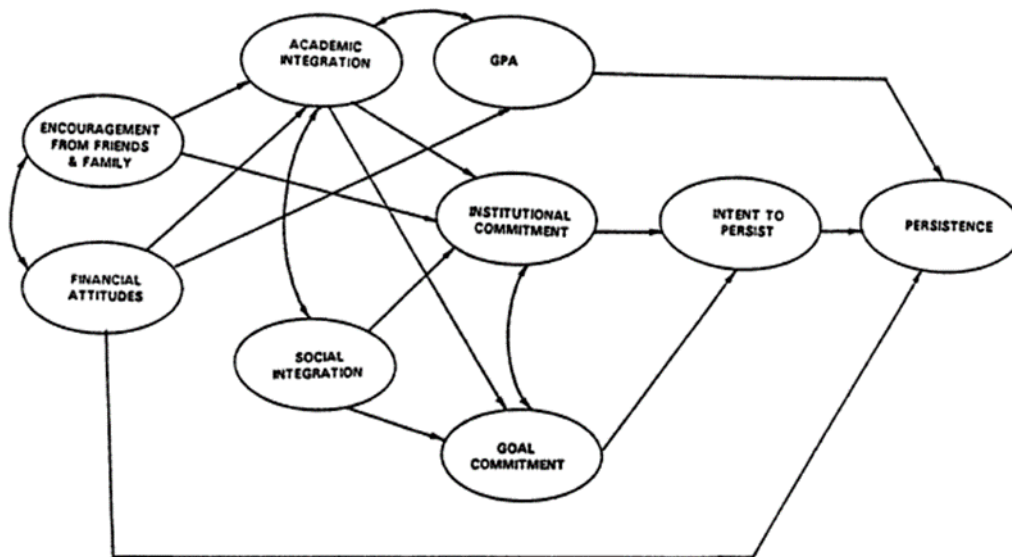
Bean and Metzner's model also included two sets of mediating variables, through which many of the other variables indirectly influenced the 'intention to leave' and finally the 'dropping out' behaviour. These mediating variables included study habits, stress and satisfaction. The 'intention to leave' construct had been explained and estimated previously by Bean (1982) and was shown to be a good precursor to drop out. This variable was central to another model also proposed by Bean (1985). The extent to which constructs have been employed and changed from one model to the next is probably best illustrated by the next model in this review in which an attempt was made to merge two previous models of attrition.

#### 2.3.4.2 The Cabrera, Nora, and Castaneda model

Cabrera, Nora, and Castaneda (1993) noted that different theoretical models of student attrition used a number of constructs that were either the same or very similar. In an attempt to simplify and get a better understanding of the issue, they attempted to merge the two models that they deemed to be most influential at the time and that had had some empirical verification. They chose Tinto's 1975 'student integration model' and Bean's (1985) 'student attrition model'. Tinto's model emphasized academic and social integration concepts influencing a student's institutional commitment; while Bean's model based on psychological processes emphasized a student's intentions to either persist or to drop out as an important mediator of actual persistence. Cabrera et al (1993) merged organisational factors (Bean's 'courses' and Tinto's academic integration)

and commitments to the institutional factors (Bean's 'institutional fit and quality' and Tinto's 'institutional commitment') from both models to advance a combined 'hypothetical model' (Figure 2.9).

Cabrera et al (1993) went on to test their combined model by gathering student data from 'traditional' students enrolling at a large university in the fall semester of 1988. Of the 2,459 students that were sent questionnaires, 466 students responded with usable data. Student performance and retention data were extracted from institutional records and added to the survey data to assess the model. A SEM approach was used employing the LISREL VII computer program to calculate parameters and model fit measurements



**Figure 2.9 Cabrera, Nora and Castaneda's hypothetical model**

A model designed from the merging of two previous model of student attrition (Cabrera et al., 1993, p. 491).

The final structural model (shown in Figure 2.9) produced differed from the hypothesized model in that no significant paths were found between financial attitudes and persistence and between social integration and goal commitment. There was also no relationship between goal and institutional commitment. Extra significant paths were found between 'encouragement from friends and family' to both social integration and goal commitment. Thus the major direct effects to persistence were from a student's GPA and from intention to persist, which itself was mostly influenced by institutional commitment. The proportion of variance explained in persistence was 47 per cent for the final structural model. Model fit was also acceptable with values for GFI of 0.97, and for AGFI of 0.96.

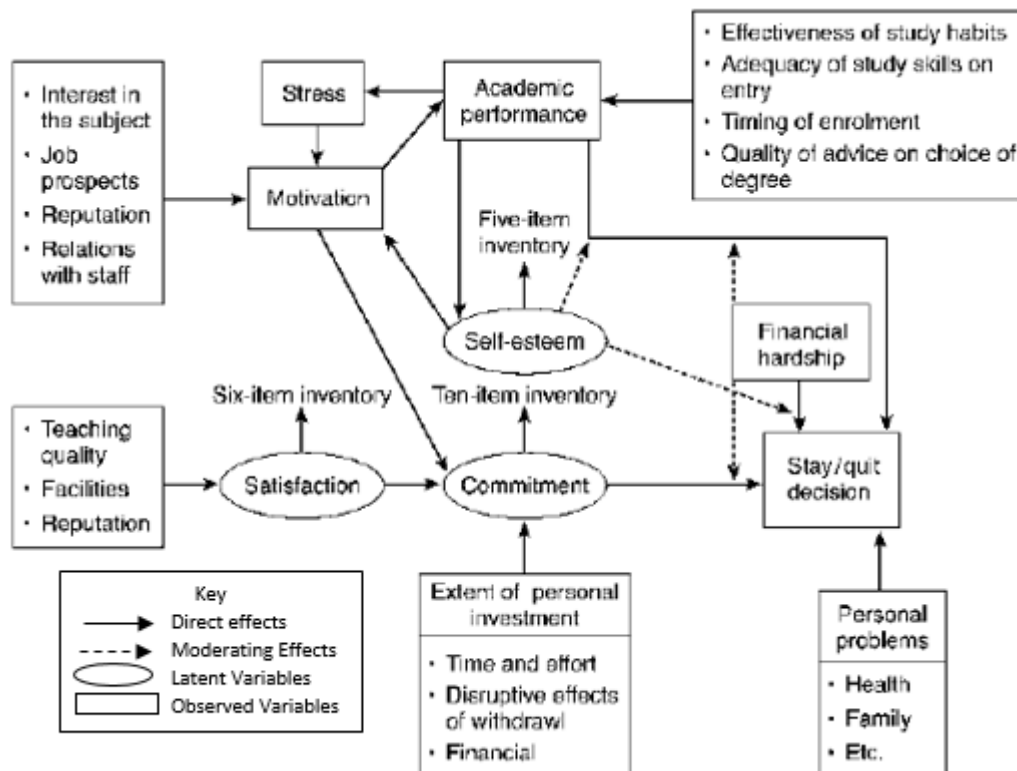
Cabrera et al (1993) demonstrated that at least two of the published attrition models shared latent factors of attrition that had in each case been named differently. By combining and merging the factors from the two models, Cabrera et al (1993) were able to advance a model that, despite some limitations, explained a greater proportion of the variance and better predicted the attrition at a large US university.

#### 2.3.4.3 *The Bennett model*

Bennett (2003), in a rare multivariate quantitative analysis performed outside of the US, investigated reasons behind student attrition in a large business studies department of a new university in London. The university under investigation was not highly selective and had average student attrition rates higher than the English average.

Bennett's study focused on financial reasons and other personal reasons for deciding to withdraw. His model incorporated some of Tinto's concepts as well as others hypothesized from results obtained from various empirical studies. In order to test his hypothesized model, Bennett constructed an appropriate survey instrument using constructs verified in past studies. Survey responses from 377 students were involved. Bennett used SPSS 11 in order to analyse various constructs and then subjected the same constructs to confirmatory factor analysis using the AMOS 4 software package. The hypothetical model was then tested and improved upon using the SEM facility in AMOS 4, by employing a 'modification index' option to reconfigure the model so as to improve the model's overall goodness of fit characteristics.

Using this process Bennett obtained the revised model shown in Figure 2.10. As shown by this model, academic performance and financial hardship were found to have direct influences on attrition. Both of these causal effects were mediated by self-esteem (shown by dotted arrows in Figure 2.10). Commitment and (non-financial) personal problems were also found to have direct effects on attrition. However, social integration had neither direct nor indirect effects and was excluded from the final revised model. Time and effort put into studies was found to have an indirect influence mediated by commitment.



**Figure 2.10 Bennett's model of student attrition from a business course**

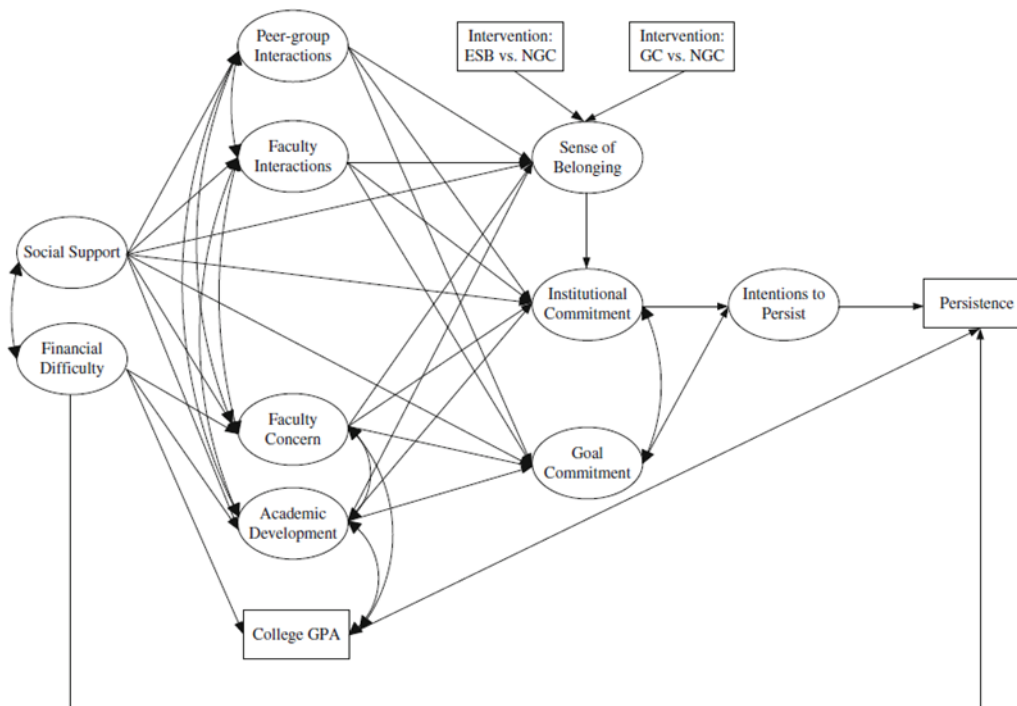
The revised model by Bennett, one of the few student attrition path models assessed outside of the US college system (Bennett, 2003, p. 135).

Bennett reported satisfactory goodness of fit statistics for the final revised model shown in Figure 2.12 (GFI=.90, AGFI=.89). The explained variance was not reported by Bennett and the study had at least two limitations, which may have affected the results of the analyses. Academic performance was self-reported by the students. This may have underestimated its effect and over-estimated the reported effects of the financial factors considered. This limitation had been reported in prior reviews on attrition (Pantages & Creedon, 1978; Summerskill, 1962; Tinto, 1993). A second limitation is that the AMOS 4 program cannot properly provide for the binary nature of the dependent variable (Arbuckle & Wothke, 1999). Attrition was measured by either a student dropping out or not dropping out. Again, this limitation may have affected the results and conclusions drawn by the author. Importantly for this current study, Bennett's hypothetical model was, however, presented as a model advocated for use in studies investigating Australian situations (Aird et al., 2010).

#### 2.3.4.4 *The Hausmann, Ye, Schofield and Woods model*

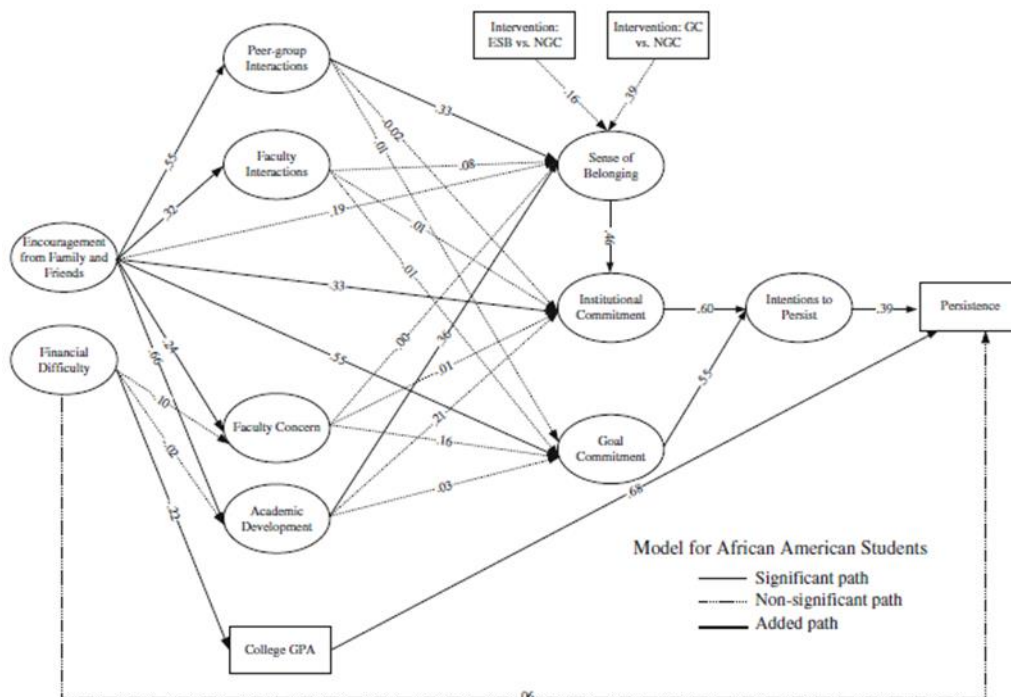
The Hausmann, Ye, Schofield and Woods (2009) model is an example of how researchers have attempted to refine a model and its underlying constructs to their own situations. Hausmann and his colleagues (2009) argued to include the concept of 'sense of belonging to an institution' as a mediating variable influencing institutional commitment. This is an important construct in the context of this current investigation as it is the basis of the 'Institutional Membership' construct within the theoretical model explained later in this chapter. Bean (1982) had previously advanced a similar concept named 'institutional fit'. This concept had been assessed by Bean using a single item. Bean had then found that this single item could be combined with a set of other items measuring institutional quality to form the so-called 'institutional fit and quality' construct. This variable was then subsequently merged with Tinto's institutional commitment by Cabrera et al (1993). Consequently, Hausmann et al (2009) were asking for the Cabrera et al.'s institutional commitment construct to be de-merged, and for a proper examination to be made of 'sense of belonging' as a separate variable influencing student attrition. This also meant that institutional commitment was similar to Tinto's interpretation of the concept which had been operationalized by Pascarella and Terenzini (1980).

Anticipating that sense of belonging would play a role in student persistence, Hausmann et al (2009) decided to examine whether the construct was also modifiable. As part of their overall study, they included a simple intervention designed specifically to increase students' sense of belonging during their first year of college. They then tested the effects of this intervention as part of the assessment of their hypothesized model of attrition. The model (Figure 2.11) also showed that they had also decided, following factor analyses, to deconstruct Tinto's and Cabrera et al.'s constructs of social and academic integration. Social integration became 'peer-group interactions' and 'faculty interactions'. Academic integration became 'faculty concern' and 'academic development' and kept GPA as a separate variable.



**Figure 2.11 Hausmann et al.'s hypothetical path model using Mplus**  
 Baseline model (Hausmann et al., 2009, p. 653).

Hausmann et al (2009) assessed the model for 'White' students and African American students using a student sample from a large, public, mid-Atlantic, predominately white university. To investigate the hypothesized model they used a 'multi group' SEM technique, employing the statistical computer program Mplus. The resultant structural models (see Figure 2.12 for African American model) indicated that sense of belonging can be considered in future models, as is done in this current investigation, as a separate variable mediating the effects of social and academic integration on student persistence or conversely student attrition.



**Figure 2.12 Final structural model for racial minority students**

The reduced path model for African American students using Mplus SEM techniques (Hausmann et al., 2009, p. 664).

Of interest was that sense of belonging had a stronger influence on institutional commitment for the minority African American group than it had for the predominant 'White' students. GPA also had a stronger direct effect on persistence for the African American group than for the white students. Overall, the final models explained 47 per cent of the variance observed in persistence for African American students and an ever greater 57 per cent for white students. The model fit values also indicated that the hypothetical model provided an adequate fit to the data (various measures including RMSEA=.072).

A few, of the many, published models of university student attrition have been presented in this review of past studies. The models have often been refined and modified to include variables influencing attrition that have been supported by empirical evidence, gathered, mainly in the US, over the last 100 years. Theoretical underpinnings have also varied to include mainly sociological and psychological constructs within the various models. The assessments of the models have often involved path analytical or more advanced SEM techniques. The vast majority of models,

however, have been single level in structure and have not included student group sizes. This is surprising.

A major focus of this current study is the assessment of the VET entrant peer group sizes as variables influencing student attrition involving the program and faculty levels. This review now considers particular studies on student attrition that have included 'peer group size' as an implied variable influencing attrition in their theoretical discussions, or that have calculated group sizes in a different manner and assessed them in less accurate terms using more rudimentary statistical estimates.

### 2.3.5 Focus on group size

A 'peer group size' factor of attrition has been implied several times in several studies of attrition but rarely has it been empirically assessed. Tinto's (1993) discussions around his model of institutional departure (Figure 2.3 shown on page 53) emphasized the influence of peer group interactions on social and academic integration and deduced the need for a critical mass for each subgroup present in a higher education institution. Oseguera (2005) found, from regression analyses on data obtained from the Cooperative Institutional Research Program (CIRP) US national surveys, that Asian and Mexican students attending institutions with large proportions of ethnic minority groups had enhanced four and six year degree completion rates. Oseguera (2005) deduced from these findings that 'Perhaps a critical mass of racially similar students with whom one can spend time outside of the classroom creates a safe space in which to pursue academic work' (2005, p. 33). Kuh (2001) recognized that subcultures within a university played roles in student attrition that had not been thoroughly examined empirically. He considered the possibility of college students belonging to two or more subgroups including groups that were essentially 'invisible' (Kuh, 2001, p. 26). He further hypothesized that minority subcultures were at greater risk of attrition because members of such minority groups would find it difficult to find 'enclaves' from which to draw support and guidance. A logical extension of this argument, not mentioned by Kuh, was that finding minority enclaves would become more likely as minority group sizes increased. Thus, in these three studies 'peer group size' was an implied factor of attrition for students belonging to some minority group.

More recently, Braxton and his colleagues (Braxton et al., 2014; Braxton & Hirschy, 2004; Braxton et al., 2004) repeated Tinto's recommendation that a critical mass of students was



needed to improve ethnic minority group retention rates. Yet, once again, group size was not included in any of the models they re-theorized using the 'Tinto template'. A new factor which could have been influenced by group size was also conceptualized. The concept, termed as 'communal potential', was defined as an individual student's conscious view that they had the potential to join a sub-group within which they shared some common attributes or values (Braxton et al., 2014; Braxton & Hirschy, 2004; Braxton et al., 2004). There was, therefore, a possibility that as a minority group's size increased each individual student from that minority increased their communal potential. However, this possible connection remained unmentioned by the authors.

In Australia several institutional studies have focused on VET entry pathways. Of these, some qualitative studies have pointed to the possibility of peer group size as a factor of how students felt and performed during their university studies. Researchers at Victoria University found that VET entry pathway students at the university preferred the presence of a group of 'pathway peers' (Keating et al., 2006). Another study at the same university showed that students within a specific pathway used each other for academic support (Milne et al., 2006). But, peer group size was neglected as a possible factor of attrition in its own right in the conclusions drawn from the studies. A possible link between peer group size and attrition could have been noted in a quantitative study undertaken at the University of Canberra. Using descriptive statistics, Cram and Watson (2008) concluded that pathways specifically developed through trans-sectoral collaboration in curriculum design were the most successful in terms of student performance and retention. However, the authors did not note that it was also the pathways with the largest enrolments of VET pathway students that had the best performance and retention averages. Conversely, the pathways that attracted the least enrolments were the ones, which resulted in academic performance and retention rates that were below the norm. These trends may have been explained, in some part at least, by the size of the VET entrant peer group that had enrolled at any one time within any specific pathway.

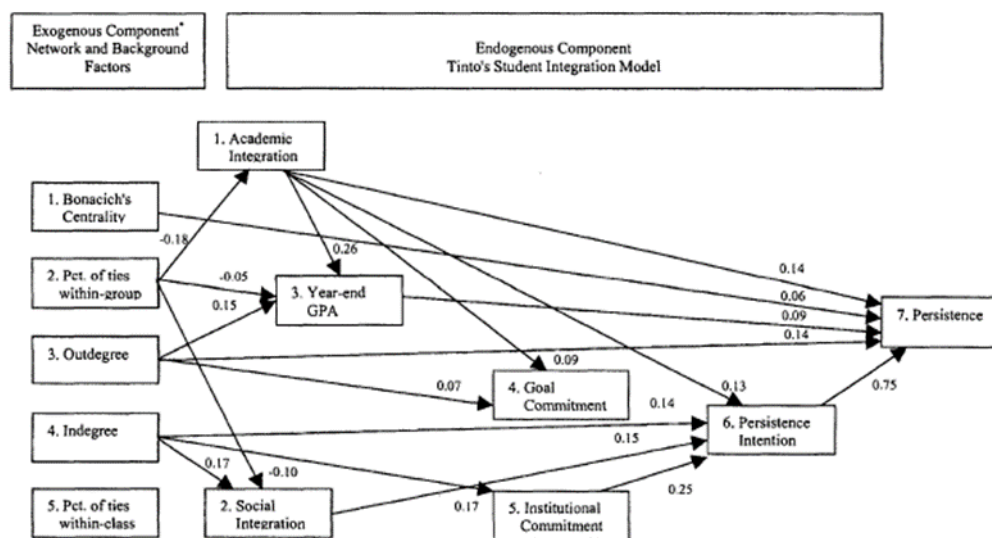
In two key US studies on student attrition, peer group sizes were considered and assessed at the friendship group level. In the first, Swenson Goguen, Hiester and Nordstruom (2010) focused on the feelings of attachment to or being a member of the institution. They took a complex view of a first year student's friendship group, first proposed by Bean (1985). In their investigation using a sample of 271 first year students from two universities, they considered newly made friends as

beneficial to this sense of membership, while friendships with old high school friends, present at the same university, as detrimental to this membership or attachment. Thus, they excluded old friends from their measure of 'number of close friends'. This 'new friendship' group size measure was, then, assessed for its effects on performance and persistence. Using logistic regression as the major analytic procedure, they found new friendship peer group size significantly predicting retention to the second year only when GPA was not included in the analysis. As in many other studies, GPA was the strongest predictor of persistence in the analyses conducted. The statistical techniques used, however, prevented the authors from having a clearer picture of the direct and indirect causal influences from the different variables that were measured. However, peer group sizes at the program level and faculty level were not considered at all, as they were not hypothesized to have any influence on the study's theoretical grounds, which focused on attachment to the institution.

Friendship peer group sizes were also assessed in a second key US study. Thomas (2000) explored new ways in which Tinto's social integration concept could be viewed from a social network perspective. Thomas considered the student peer group as having a central contextual role in understanding a variety of college outcomes, including student attrition. According to Thomas, Tinto's social integration contained implicit constructs which remained untested. It was his intention to explore 'a more appropriate empirical elaboration of the [social] integration construct' (Thomas, 2000, p. 592). Thomas' understanding of social networks included both acquaintances and closer friendship groups. He measured social networks and social structure by asking students the names of friends and acquaintances and matching this information across friendship groups. Peer group sizes, termed as 'clique' sizes, were also measured. Thomas was, however, more focused on the social network concept of 'centrality'. He hypothesized that the more central a student was, the easier it was for them to acquire information and resources. This centrality was postulated to lead to better social integration and better chances of persisting.

Thomas tested his hypotheses within a model of persistence, using primary longitudinal survey data and secondary institutional data of the student 'freshman' year of 1992 from a small four year liberal arts college in western United States. Structural social network data were collected by asking the first year students who responded to the survey to list the names of those students with whom they frequently spoke and the dimensions on which they related to these other students, namely as a close personal friend or a source of academic or social advice. A student's

ability to connect was assessed by counting the number of nominations students received across different peer groups. This information was used to construct five separate social network variables: Bonachich's centrality; outdegree; indegree; percentage within group; and percentage of ties within class. Thomas employed LISREL 8, with a specification that measured persistence as a dichotomous outcome, that is, either dropped out or persisted. Thomas used the LISREL 8 program to first test all possible paths linking the variables measured and then through an iterative process, deleting paths from the model that were not significant. The resultant model is shown in Figure 2.13.



**Figure 2.13 Thomas' structural model of student persistence**  
The estimated model (Thomas, 2000, p. 604).

Results from the analyses indicated that students who had a higher 'connectedness', as assessed by the different variables were better able to persist to the second year. Three of the five social network variables were found to have positive direct and indirect effects on persistence through social and academic integration, and a student's GPA. One variable, 'percentage of ties within group', however, had a negative indirect effect. Thus, when students restricted themselves to just the one peer group and did not make broader connections across different peer groups, this lack of a diversified set of contacts had negative effects on students' integration and performance.

While Thomas' discussions focused on the importance of a student's centrality and connectedness having small but significant direct and indirect influences on persistence, of interest to this current study were his assessments of network peer group size or 'clique size'. Thomas found that clique sizes ranged between one and 11 with a mean of around four. These different student network peer group sizes were not included in Thomas' model shown in Figure 2.13, however, he identified them for future research. He stated "Although these differences [between clique sizes] are not modeled in the present study, the exploitation of such differences provides promising areas for future research" (Thomas, 2000, p. 603).

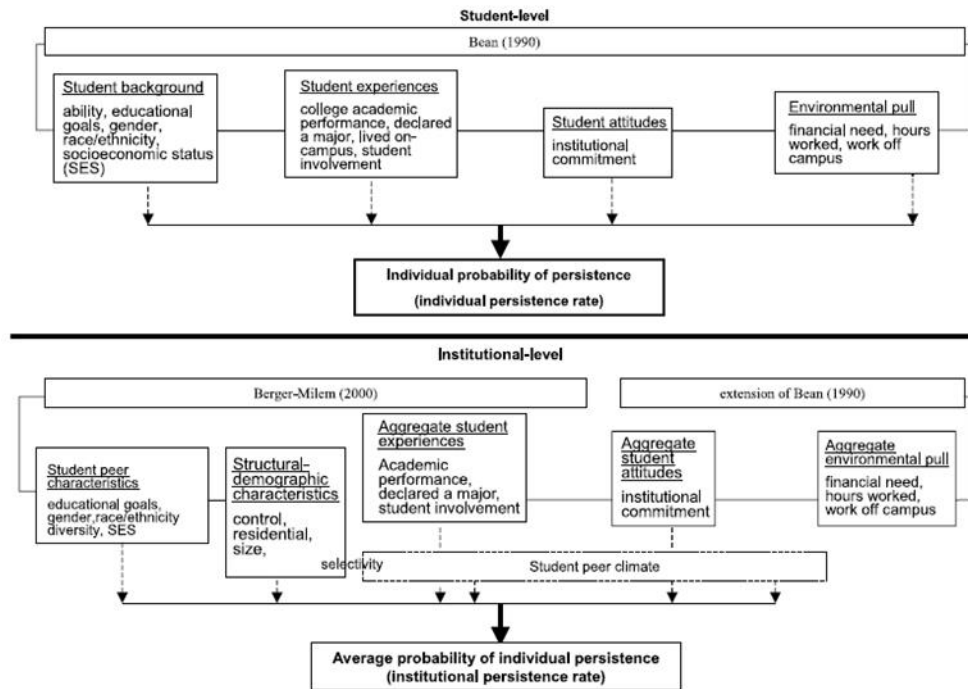
By asking for the names of individuals and cross checking from institutional data, Thomas was able to gather group level variables including: average group persistence, group GPA averages, group aptitude (using SAT scores), group minority proportions, and group gender proportions. However, these group level variables, like group size, were not modelled. For these variables to have been accurately assessed Thomas would have needed a method of analysis which incorporated a multilevel structure. This review thus now considers a small number of studies that have used multilevel approaches to examine the university student attrition issue.

### 2.3.6 Studies using a multilevel approach

Titus (2004) was one of the first scholars to use a multilevel approach to examine the university student attrition problem. In order to assess the issue, Titus conceptualized student persistence as a multilevel phenomenon. He combined two previous models of persistence, those of Bean (1990) and of Berger and Milem (2000), to construct a model with a two-level structure (Figure 2.14). In order to test his model, he obtained student level data from a nationwide survey database in the US, the 1996-1998 Beginning Postsecondary Students (BPS) survey, and institutional level data from the Integrated Postsecondary Education Data System (IPEDS).

Titus was also able to aggregate student level data to obtain extra institutional level data. His sample included 5,151 students and 384 institutions. He assessed the effects of the different variables on student level persistence using hierarchical generalized linear modelling (HGLM). Before taking institutional factors into consideration, Titus first established that a sufficient amount of variance in student persistence existed between students in different institutions that could not be explained by student level factors alone. The Bernoulli sampling option within HGLM

was used to provide for the dichotomous nature of the way persistence was measured (that is either persisted or not persisted into the third year of studies in a 4-year institution).



**Figure 2.14 Titus' hypothetical two level model**

Conceptual model to examine college student persistence (Titus, 2004, p. 678).

Most of the results confirmed those obtained from previous research. The following student level variables were shown to be positively related to the chances of a student persisting: ability, educational goal, GPA, living on campus, institutional commitment, and financial need. A positive relationship was also shown between persistence and hours worked per week. This implied that a student's persistence improved as the student worked more hours in a job not related to his or her studies. This result remained unexplained, and Titus suggested further research was needed to elucidate what was involved. The following institutional level variables were found to be related to student level persistence: residential, size, and selectivity. Thus, larger universities, namely those where students resided within campus boarding houses, and those that had stringent selection criteria were found to have positive associations with student persistence over and above any student level effects. Aggregated institutional commitment was also found to be related to aggregated student level persistence. The results thus were supportive of earlier findings deduced from descriptive statistics at the institutional level (e.g. Iffert, 1958; McNeely, 1937).

Subsequently, Titus (2006b) reused the same 1996-1998 sample and added more institutional level variables, including an institution's revenue and expenditure patterns. In a separate publication, he added two more years of data to his original sample (Titus, 2006a). Results of these further analyses showed that over and above student level and institutional level variables investigated in the earlier study (Titus, 2004), institutions that gathered a larger percentage of the revenue from tuition and those that spent less on administration costs had a greater average rate of student persistence. He also found that student level SES background were negatively associated with persistence. That is those students coming from the low SES backgrounds (assessed in SES quartiles) were associated with a lower rate of persistence than those coming from high SES backgrounds. The effect was also present at the institution level. Consequently, a higher average socio-economic status environment in the institution was also associated with higher levels of student level persistence (Titus, 2006a). The 2006 studies also showed a negative effect on persistence from hours worked in a job when this variable was assessed in a categorical manner (in four groups measuring 0, 1-10, 11-20, more than 20 hours per week). Interestingly, this was the opposite result to the 2004 study, in which 'hours worked' was assessed as a continuous variable.

In relation to this current study, Titus (2006a) also found that the level to which an institution contained a diverse population influenced the student level persistence. Diversity throughout the institution was assessed using Chang's (1999) 'diversity index'. This result indicated that as minority student (racial in this case) numbers increased in proportion to the whole student population, all students in general tended to have a higher level of persistence. There is a limitation in the ability to compare these results with previous studies on university or college student attrition. Titus defined persistence as 'continuing to the 3<sup>rd</sup> year' for two of his studies (2004, 2006b) and as 'degree attainment after six years' in his final study (Titus, 2006a). A number of other variables within the three studies were also defined differently, such as the described changes to the way 'hours worked per week' was assessed. Thus, comparisons need caution.

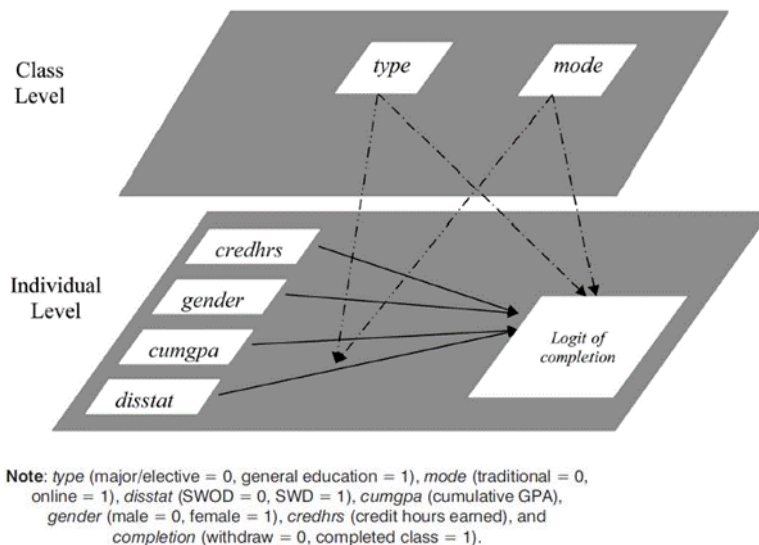
Like Titus, Franke (2012) made use of BPS survey data (2004-2009) for a multilevel assessment of college student attrition, for his doctoral dissertation. Franke (2012) used a sample of 6,561 students attending 651 four-year colleges across the US to assess the effect of financial aid on six-year degree attainment. A multilevel (HGLM) approach was used to apportion variance at the

different levels. Results showed that over and above student level factors, financial aid influenced six-year degree attainment for all but high-income students. The greatest influences were found when low-income students received need-based grants from all sources. Results also confirmed that, while controlling for all student level and institutional level factors, low-income students were significantly less likely to attain a baccalaureate degree. Other student level factors having a statistically positive influence on the attainment of a degree included academic performance in college and high school, social integration, and living on campus. Working more than 20 hours was found to have a significant negative effect. In regards to institutional level factors, attending a low selectivity institution or an institution with a high proportion of part-time students was found to have a negative influence on student level attainment of a baccalaureate degree. Confirming Titus' findings, institutional structural diversity, assessed by the proportions of minority students within an institution, was found to have a positive effect on the attainment of a degree within six years.

Oseguera and Rhee (2009) used Titus' two level model (Figure 2.14) to explore whether 'institutional retention climate' influenced student level persistence over and above Titus' student level and institutional level variables. Using a large sample of 37,006 students belonging to 170 four-year institutions in the US obtained from the US national CIRP 1994-2000 surveys, Oseguera and Rhee (2009) aggregated data to obtain average intentions to drop out permanently, temporarily or to transfer for each institution. Like Titus, the authors of this study employed HGLM and multivariate hypothesis tests to separate student level factors from institution level factors of student persistence. The following student level variables were significantly positively associated with student level persistence: being Asian, SES, high school GPA, SAT scores, and living on campus. Being Latino, having financial concerns, and intending to transfer were all significantly negatively associated with student persistence. At the institutional level, aggregated high school GPA, institutional selectivity, and aggregated institutional retention climate were positively associated with persistence. This last result from the analyses showed that after controlling for a student's personal likelihood of withdrawing, enrolling in an institution where that sentiment was expressed by others, had an independent significant effect on a student's eventual withdrawal behaviour. This suggested that, if students withdrew around you, you were also more likely to withdraw. One major non-significant finding was that, in contrast to Titus' and Franke's findings, a high level of racial diversity within an institution had no effect on student level persistence. In order to report explained variance the authors examined the

institutional level variance as well as student level variance. They showed that around 69 per cent of the variance in mean persistence rates was explained by the model, made up mainly by the variance explained by aggregated student level variables (58%) that were added to the variance explained by institutional level variables (11%).

Finally, in a smaller but elegant study, Stewart, Mallery and Choi (2013), took account of course level variables. The authors examined student attrition at a comprehensive, midsized Historically Black College on the east coast of the US. HGLM was used on a sample of 3,488 students at the college to separate effects of four student level factors (gender, GPA, credit hours, and disability status) and two course level factors (type and mode) on student level course completion (Figure 2.15). GPA and credit hours were shown to have significant effects on completion, after taking both level factors into account. With regard to the course level variables, results showed that students were significantly less likely to complete online delivery courses as opposed to face-to-face courses after controlling for student level factors.



**Figure 2.15 Stewart, Mallery and Choi's two level model**  
Individual and class level factors that influence course completion (Stewart et al., 2013, p. 375).

### 2.3.7 Integrating peer group size within a multilevel model

The first part of the review of past studies has covered investigations mainly focusing on individual student level factors such as first semester GPA, social integration and institutional commitment. The latter part of this review covered several studies that had sought to use a multilevel approach to view the student attrition issue. Three levels of influence have been



covered by this last set of investigations: the individual student level; the course level; and the institutional level. No single past study, however, has sought to assess simultaneously more than two levels of variables. This study needs to do so by assessing the hypothesized effects of: individual student level, program level, and faculty level factors influencing attrition.

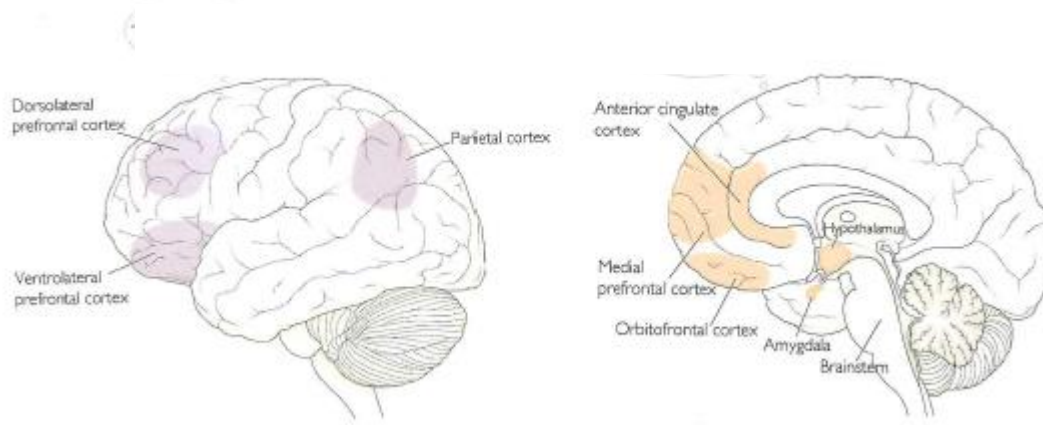
As explained thus far, the importance of peer group size, referred to in this study, had in the past often been implied. Previous studies, mainly dealing with ethnic minority groups, had shown that group under-representation led to higher attrition. Type of institution was hypothesized to be relevant. Selective universities, like the university in this study, were predominantly populated by traditional students, with minority groups existing in relatively smaller proportions. Program and faculty peer group sizes as variables, however, had not been included in any previous models of student attrition. Consequently they are examined in this investigation as a program level and a faculty level variable.

As minimal amounts of total variance had been explained by the established models of student attrition, Braxton and Hirschy (2004) advocated the use of multiple theoretical perspectives to view the student attrition problem, particularly in situations where high attrition levels were prevalent. Thus, several theoretical issues underpin the ways in which the variables are introduced in sequence within the theoretical model examined in this investigation. Using a multilevel approach, this investigation assesses the effects of both program and faculty peer group sizes as well as a number of other hypothesized factors influencing attrition for students entering an Australian university using VET entry pathways.

### 2.3.8 A theoretical framework to encompass biological notions involved with group sizes

A theoretical framework has yet to be applied to the university student attrition situation that has a biological basis. As discussed earlier in this chapter, Summerskil mentioned the biological aspects involved when a student decided whether to persist to drop out of university, but his argument was based on only the related psychological notions of motivation and commitment. A recent investigation into the neurological activities of the brain, coupled with a simple experiment on choices made by participants, have provided a suitable perspective on which to base the notions of peer group sizes and academic efficiency that are introduced in this investigation.

Eagleman (2015) proposed that the logical decision making process in humans was disrupted by emotional content. Using neural imaging, Eagleman demonstrated how different parts of the brain, shown in Figure 2.16, were activated when logical solving decisions were made as opposed to emotional decisions.



**Figure 2.16 Eagleman's neural imaging of the brain during decision making.**

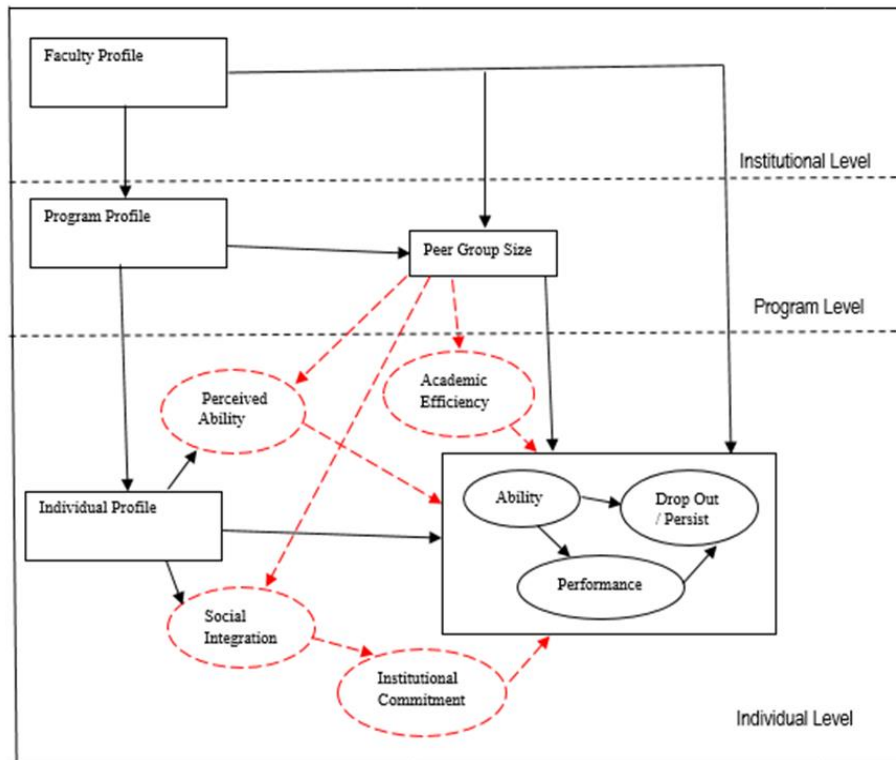
The figure shows brain activity captured by neural imaging of a brain making a logical decision (on the left) and an emotional decision (on the right) (Eagleman, 2015, pp. 108-109).

Eagleman argued that most situations requiring a decision involved more detail than logical thought alone could process. The emotional input added the extra information needed to make the decision making process possible. Thus, Eagleman proposed that the decision making process was influenced by, at least, two often conflicting notions: logic and emotion. He further argued that to make a choice the brain processed all the data in a logical and emotional combination and arrived at an 'anticipated reward' measure, which would predict a final outcome for any decisional option. As Eagleman explained this measure would need to have a common value so that each decision could be compared and evaluated by the brain. Eagleman suggested that, as individuals learned from experiences, this reward system updated itself and became more refined.

## **2.4 Theoretical model: peer group size within a multilevel framework**

The theoretical model which is the basis for this study has been informed by a number of past theoretical studies, including Ajzen's (1991) Theory of Planned Behaviour, Bandura's (1997)

concept of self-efficacy, Tinto's (1993) model for individual attrition from college, Bennett's (2003) model of attrition from a university business course, Pace's (1982) concept of quality of effort, Sumpter's (2006) 'Principles of Collective Behaviour' and from Eagleman's (2015) decision making process.



**Figure 2.17 The multilevel conceptual model**

Multi-level conceptual model of individual undergraduate student attrition from an Australian university of students entering through VET entry pathways. Adapted from Ajzen's (1991) Theory of Planned Behaviour, Bandura's (1997) concept of self-efficacy, Tinto's (1993) model for individual attrition from college, Bennett's (2003) model of attrition from a university business course, Pace's (1982) concept of quality of effort, Sumpter's (2006) 'Principles of Collective Behaviour' and from Eagleman's (2015) decision making process. Red dotted lines represent causal paths and variables examined using primary survey data. Black lines represent causal paths and variables examined using secondary university record data.

The multi-level model (shown in Figure 2.17) proposes that students entering through VET entry pathways are influenced by a number of different level variables in their decision to either drop out or persist in their university studies. A number of other variables including gender, age, SES background, basis of admission, timing of enrolment, study load and various peer group sizes are considered at the appropriate levels as part of the separate level effects. With regards to the focus of this study, the model hypothesizes that program peer group size, assessed by the total number of students entering on the basis of a completed VET qualification within any program influences attrition through at least three separate causal paths, which are assessed using both

primary survey data (depicted by red dashed lines in Figure 2.17) and secondary data (depicted by the black lines in Figure 2.17) accessed from university internal records.

#### 2.4.1 The social integration – institutional commitment causal link

The first causal path is hypothesized largely from educational concepts devised by Tinto (1993), interpreted by Bennett (2003), and supported by more recent reviews dealing with entrance to university through diversified pathways in Australian contexts (Aird et al., 2010; Gabb et al., 2006).

In this causal path, program peer group size is hypothesized to influence the student's ability to socially integrate which in turn influences persistence through enhanced commitment to the institution. The 'program peer group size' as an explanatory variable of social integration has been previously mentioned by Tinto (1993) in his theoretical discussion of attrition for students attending mainly residential universities and colleges in the U.S. but is not specifically represented within his framework.

In Bennett's (2003) model of attrition from a university business course in the U.K. the notion of social integration was similarly hypothesized to lead to a student's commitment to stay at an institution, however, without making any link to peer group sizes. There are several similarities between Bennett's context and the one for this study. The Australian HE system was often closely compared to the UK HE system (Aird et al., 2010). Business VET related studies were also the largest section of the Australian VET sector in terms of student enrolment (NCVER, 2012, p. 16) and therefore provided the largest catchment for VET entry pathways. An internal study at an Australian university has also identified business related studies as the largest enrolment recipients of VET entry pathways (Lovat, 2012).

The social integration construct as defined by Tinto as 'the form of integration which results from personal affiliations and from the day-to-day interactions among different members of (the) society' (Tinto, 1993, p. 101) has been interpreted by Bennett (2003) to include interactions with both fellow students as well as university staff and with the notion or idea of self-esteem. This social integration in Tinto's proposed model (as well as Bennett's hypothesized model) led to the 'Internal Commitment' variable. This variable was defined by Tinto as combining goal commitment, namely 'a person's willingness to work toward personal educational (and

occupational) goals', and institutional commitment, namely 'the degree to which one is willing to work toward the attainment of one's goals within a given higher educational institution' (Tinto, 1993, p. 43). In his theory, Tinto proposed goal commitment, institutional commitment and the additional notion or idea of 'intention' to directly influence the student's departure decision. Thus the 'institutional commitment' construct used in this model includes all these three ideas or notions, and can be expressed as 'a person's willingness and intention to work toward personal educational goals within a given higher educational institution'. Like Bennett, this study also disconnects the idea or notion of self-esteem from the social integration construct and includes this within another construct, that of 'perceived ability'. Institutional commitment in this sense shares much with Ajzen's idea or notion of intention and with its antecedent of 'subjective norm' (Ajzen, 1991). Ajzen's behavioural intention and Tinto's (and Bennett's) educational notion of commitment are hypothesized to influence directly the decision to stay or quit university as is hypothesized for the 'institutional commitment' defined within this study.

#### 2.4.2 The academic efficiency causal link

A second causal path within the theoretical model hypothesizes that program peer group size influences an individual student's 'academic efficiency' which in turn influences a student's 'academic performance' and persistence at university.

While Tinto includes 'academic performance' in his view of 'academic integration' (Bennett, 2003; Gabb et al., 2006; Tinto, 1993), the model shown in Figure 2.18 attaches the idea of 'perceived academic performance' to 'academic effort' in a combined construct named 'academic efficiency'. It is proposed that academic performance, in terms of academic achievement, comes at a price that is measured in academic effort to achieve. Thus, it is hypothesized that if a student is able to reach an acceptable level of achievement using less (academic) effort, they will be less likely to drop out than if a student achieves a similar level using much greater (academic) effort. This notion, in the educational sense, is largely based on studies by Pace (1982). Pace (1982) described his idea or notion of 'quality of effort' as 'using resources available in an efficient manner to achieve the greatest return in terms of academic performance'. This study's definition of academic efficiency, thus, uses this definition plus the added aspect of 'academic performance as perceived by an individual student'. In other words, the model for this study hypothesizes that larger peer group sizes allow greater academic efficiency as students within the group have greater opportunity of sharing salient information and advice allowing for greater efficiencies in

achieving acceptable academic performance being obtained through acceptable levels of effort. This enhanced academic efficiency and performance, both real and perceived, in turn is hypothesized to influence a student's chances of survival at university.

Academic efficiencies resonate with Eagleman's (2015) recent theories on how decisions were made in the human brain. Eagleman argued that when faced with a decision the brain simulated different outcomes. The optimum outcome was then decided upon using a 'common currency of future reward' (Eagleman, 2015, p. 115). Academic Efficiency in this investigation can be viewed as this 'common currency', where students gauge their rewards, in terms of acceptable perceived academic performances achieved for one unit effort. Measuring Academic Efficiency as a ratio of perceived performance over the effort expended makes the currency more comparable or more 'common' as Eagleman described it. It also makes the measure an assessment of learning or study efficiency.

Improving efficiency in terms of performance by being part of a group can also be viewed in an evolutionary sense as proposed by theories on natural 'collective behaviour'. Increased efficiencies in problem solving by small groups as opposed to individuals have been noted for some time (Hill, 1982; Shaw, 1932; Taylor & Faust, 1952). These early studies have been supported by more recent research evaluating team performance and achievement (Chiocchio & Essiembre, 2009; Williams Wooley, Chabris, Pentland, Hashmi, & Malone, 2010). While these later studies have not considered individual level performance and achievement, natural efficiencies within groups provide a basis for natural controls to play a part. Human collective behaviour, supported by studies in sociological and cognitive sciences (Goldstone & Janssen, 2005; Macy & Willer, 2002), which took into account these natural efficiencies, has been noticed and found to be predictable under certain conditions, particularly under stress (Sumpter, 2006). These collective principles suggested that increased group sizes enhanced both group and individual performance of tasks as well as individual avoidance of dangers. A natural tendency to form groups in this respect was seen as an innate biological aspect linked to evolutionary selection forces (Sumpter, 2006). The notions of peer group size and critical mass were central to this collective behaviour theory and are readily assessable in this investigation.

Following this line of thinking, it is proposed that program peer group size, within the model advanced in this study, enhances academic efficiency by the concept of enhanced information

processing. This concept as it refers to groups performing cognitive tasks has been previously described and defined to include 'processing objectives, attention to and accessibility to seminal information, evaluative judgement or opinion and problem solving' (Hinsz, Tindale, & Vollrath, 1997). The importance of variety of individuals within the group was interestingly pointed out by the psychological view and necessitated by the biological one (Hinsz et al., 1997; Sumpter, 2006). Thus our construct of academic efficiency is defined as 'using resources including help from peers in processing objectives, attention to seminal information, evaluative judgement and problem solving to enhance the attainment of an individual student's perceived academic performance'.

### 2.4.3 The perceived ability causal link

A third causal path is also posited in the above model through a student's perceived ability which in this study is defined as 'a person's confidence in their ability to perform academically'. This line of causality is based on Ajzen's (1991) planned behaviour and Bandura's (1997) self-efficacy principles.

The theory of planned behaviour hypothesized that human behaviour could be directly influenced by 'perceived behavioural control' or 'perceived ability' that itself was defined as 'people's perception of the ease or difficulty of performing the behaviour of interest' (Ajzen, 1991, p. 183). Similarly Bandura's 'perceived self-efficacy' principles, which lie at the heart of Ajzen's construct, were 'concerned with judgements of how well one can execute courses of action required to deal with prospective situations' (Bandura 1982 cited in Ajzen, 1991, p. 184). These constructs, in an educational context, have supporting empirical evidence for their relationship as being influenced by past academic achievement, and for predicting future academic achievement, and as a strong predictor of persistence (Bandura, 1997, p. 96).

Program peer group size as a predictor of perceived ability in this causal path is specifically supported by Bandura's notion of 'vicarious experience'. This notion suggested that confidence in one's own capabilities was enhanced by comparing one's own attainment to the attainment of others that were most similar to oneself in competence (Bandura, 1997, p. 101), that were in close proximity, and that were 'engaged in similar behaviours' (Bandura, 1997, pp. 87, 96, 98). A visible peer group size of VET entrants thus allows for this comparison to take place.

This link is also posited to span across different levels within the university setting, that is across programs and across faculties as individual VET entrants within one program compare themselves with VET entrants undertaking studies within programs in other faculties of the university. This position is supported by the view that seeing other individuals of similar status succeed within a diversity of levels further enhanced self-belief (Bandura, 1997, p. 99). The notion that a similar individual has been able to cope with adversity (Bandura, 1997, pp. 99-100) suggests that influence from others succeeding may even span across enrolment years, as individual VET entrants in one year see their VET seniors having succeeded and progressed to their second or third years of university study. Bandura (1997, p. 100) called this 'historical modelling'.

Therefore, our model for this study hypothesizes an influence on perceived ability from being part of a larger sized group. This notion is based on the perception that if a 'VET' peer or even more so a 'group' of 'VET' peers can achieve and survive this positively influences a student's own perceived ability to achieve and survive. 'If they can do it, so can I'. It is proposed that this perceived ability is, therefore, influenced by greater program peer group sizes as they become more visible to the individual even across different programs and different faculties within the university.

#### 2.4.4 A model for the drop out decision making process

An overarching individual level sub-framework is hypothesized for the final drop out decision making process. Eagleman (2015) proposed that immediately prior to making a decision, the human brain activated different regions of the brain involved in 'logical problem solving' and in 'emotions'. These two areas of the brain can also be viewed as concepts or notions, which can influence the decision process. Thus, the two notions are postulated to provide an overarching sub-framework over the temporally later variables postulated to influence the decision to drop out. The variables within such a framework are depicted as elliptical shapes within the individual level in the theoretical framework in Figure 2.17. Program peer group size is hypothesized to influence these variables within this overarching individual level sub-framework as explained in sections 2.3.1, 2.3.2 and 2.3.3. This sub-framework clarifies the way the human brain and therefore the individual student processes the different variables that are assessed in this investigation and thus gives an indication of how the process takes place biologically.



#### 2.4.5 Variables not covered by the model

The model in Figure 2.17 may not explain all student attrition. The focus of this study on the effect of small group sizes presents us with a dilemma. The relatively small number of VET entrants at the university in this investigation, which is hypothesized to influence student attrition, also limits the number of constructs which can be quantitatively assessed, in a statistical sense, in the multilevel, multivariate analysis.

Quality of teaching, for example, and teaching using collaborative and cooperative learning techniques considered as a separate program level variable (Bennett, 2003; Gabb et al., 2006) may be intrinsically related to the 'peer group' notion but this relationship is not analysed quantitatively in this study. Stress aversion, in particular, is regarded as a major way of positively altering efficacy beliefs (Bandura 1991a; Cioffi 1991a as cited in Bandura, 1997, p. 106). Peer groups, in this respect, may possibly be a stress reliever and thus may have an influence on this study's perceived and real ability constructs. Stress itself has, in the past, been identified as a predictor of departure from university studies (Bennett, 2003) but is not quantitatively evaluated in this study.

There may be other causal paths that have not been considered and that may or may not have peer group size as a determinant. Financial issues are not considered in this model but may play a major role in institutional attrition in this context (see Bennett, 2003). Other factors such as course preference and course fit, which are not covered may be additional factors not connected to peer group size (Gabb et al., 2006).

Previous research on attrition rates among students taking VET entry pathways has suggested that structural attributes of different kinds of pathways may also influence both academic performance and retention (Cram & Watson, 2008). While some variability in pathway type is evident at the university in this investigation, students included in the analysis either came through a traditional articulated pathway, where a student completes a VET qualification and then enters a related university qualification with some credit, or they used their completed VET qualification and entered without taking any credit (see Wheelahan & Moody, 2011). Thus different pathway structures (see Cram & Watson, 2008; Jackson, Paez, Byrnes, Dwyer, & Blacker, 2011) cannot properly be addressed by this present study.

Some of the above-mentioned variables, as well as additional variables, are addressed in a qualitative analysis of the open-ended questions of the survey used in this study and in the interviews undertaken as part of this investigation. This leads us to consider the operationalization of the constructs within the theoretical model (Figure 2.17) of this study.

## **3 Research Model and Measurements**

### **3.1 Research model: peer group size within a multilevel framework**

The research model for this investigation is developed from the theoretical model presented in the previous chapter. Many of the concepts included in the theoretical model have been operationalized and evaluated in past studies, some of which have been covered in Chapter 2. The final research model, shown in Figure 3.1, is a combination of past models of attrition advanced to be examined and estimated in the context of this investigation. The model also incorporates the untested concept of peer group size as a central construct. There are some basic features of the research model that need to be explained.

First, the research model like the theoretical model has three levels. Within the first or student level, many of the constructs, such as 'institutional commitment' and 'perceived educational ability', have been described and operationalized in past studies of university student attrition. Some of these constructs are renamed to suit the particular context of this investigation. Within the second and third levels most of the constructs are introduced for the first time as this is one of the first multilevel investigations of the student attrition issue.

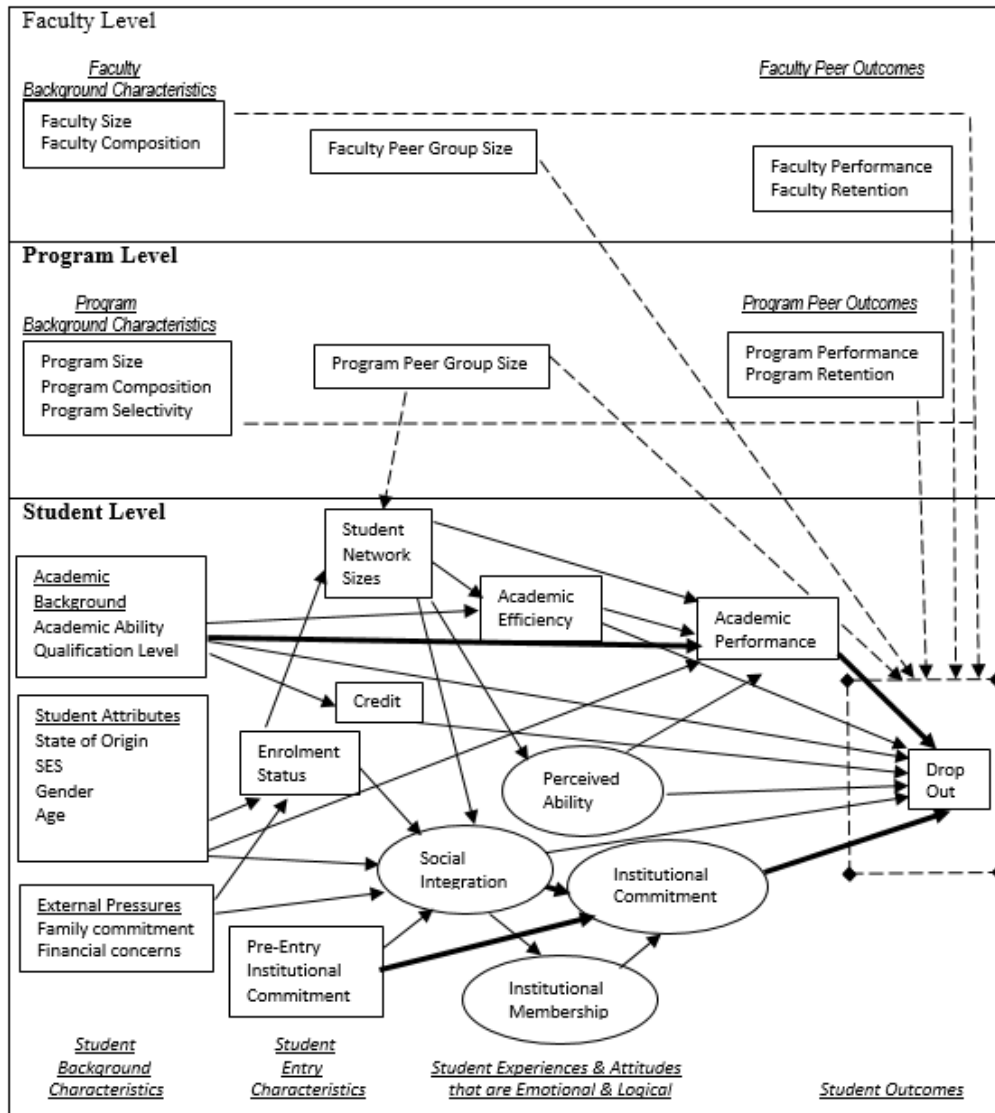
Many of the constructs themselves have often been listed under various headings in the past, such as 'background variables' (Bean & Metzner, 1985), 'social and academic systems' (Tinto, 1975, 1993), or 'experiences' and 'attitudes' (Titus, 2004). In the research model for this investigation the constructs or headings, where possible, are taken from past studies for consistency and comparative purposes. In the research model there is, however, no relationship between these construct headings. Rather, headings for the various constructs within the three levels included in the research model are purposely placed on a continuum with some constructs fitting under one heading, others fitting under more than one heading, and others still not fitting within any of the headings. For example, while gender and age fit under the 'background variables' heading, GPA can be regarded as both an experience and an outcome (Bean & Metzner, 1985; Titus, 2004). The heading covering experiences and attitudes is adjusted to include the notions of emotion and logic to account for the sub-framework discussed in Section 2.4.4.

'Peer group size', a key construct of this investigation, at two levels, namely the Faculty and Program levels, is associated with the Student Network Size at the Student Level. These group sizes may be seen to exist from the start of a time period. But it is the conscious, or possibly even subconscious, interactions between the groups and the individual which matter, and which are postulated to take place throughout the study time period. At the individual student level, the sizes of the groups are assessed from the network sizes reported by the student. These conscious groups can be thought of as either an entry characteristic, a concept which is established very early in the time period and changes little over the course of the period, or as a later development and more of a student experience. Similarly, between the three different structural levels there is a situation of a continuum. The social network sizes are placed within the student level but are related to the program and faculty levels. Again, this is done purposely to point out that the levels themselves can also be conceptually subdivided into more dimensions. For example, if more time and resources were given to this investigation more information could have been gathered so that another 'network peer group' level could have resulted between the individual and the program.

The number of variables in the research model is large in comparison to some studies, but the list of variables is not exhaustive. This study does not set out to cover all possible factors influencing student attrition. In addition, several limitations reduce the amount of data collected. The study is retrospective, many of the students have already left the university. Where data are gathered through a survey instrument, the students are asked to recall attitudes and perceptions in retrospect. The survey instrument is purposely short and requires minimal effort to complete. It also avoids ethically sensitive topics such as financial backgrounds and asking for personal information such as names of friends. Focus is placed on gathering data involving possible causes of attrition that are connected to the postulated peer group size effects.

In the research model shown in Figure 3.1, variables and constructs are placed in a temporal sequence, going from left to right. Causal paths of influence are shown in two styles, continuous lines indicating postulated causality at the student level, and dashed lines indicating paths of causality from program or faculty levels. Causal paths with strong past empirical support from previous studies are given heavier weighting and are hypothesized to have a stronger influence in this investigation. The stronger causal lines are those that link past academic performance to subsequent academic performance (Bean & Metzner, 1985; Iffert, 1958; Pantages & Creedon,

1978), GPA to dropout (Bean & Metzner, 1985; Cabrera et al., 1993; Spady, 1971), initial institutional commitment and social integration to subsequent institutional commitment (Braxton et al., 2014; Pascarella & Chapman, 1983a), as well as institutional commitment to dropout (Bennett, 2003; Tinto, 1993). All other causal paths coming from the higher levels are not given extra weighting as they have limited empirical support from previous studies.



**Figure 3.1 The research model**

Research model of individual undergraduate student attrition from an Australian university for students entering via VET entry pathways. Variables are depicted within rectangular boxes if they are observed or manifest and elliptical shapes if they are latent. Causal paths operating at the student level are shown by filled lined arrows. The thicker lines represent stronger hypothesized paths of influence. Causal paths operating from the Program and Faculty levels are shown by dotted lined arrows. The paths originating from these levels end at a dotted line box shape. This represents that the Program and Faculty level variables as having direct and moderating effects on the Drop Out variable.

As discussed in Chapter 2, the temporal sequencing of the hypothesized factors of attrition allows a sub-framework to be introduced within the research model. The factors closest to the 'Drop Out' decision are considered as 'Logical and Emotional' factors. The heading that groups these temporally later variables is given as 'Student Experiences and Attitudes that are Logical and Emotional'. This delineation is based on Eagleman's (2015) views that certain factors such as those based on emotions and those based on logic have additive influences on the final decision making process.

## **3.2 Operationalization and measurement**

The way concepts are assessed within any statistical study is important. As is discussed in the previous chapter, in the field of university student attrition concepts have often been assessed inconsistently (Tinto, 2012). An attempt is made to maintain a level of consistency with past studies in the operationalization and assessment of such constructs. The following variables and possible factors of influence, collected from university and state admission centre records and from a survey instrument (Appendix 1), are considered for this investigation. They are listed according to the level from a multilevel perspective of the student attrition issue at the university. A summary of the variables included in this investigation are presented at the end of this chapter in Table 3.1, Table 3.2, and Table 3.3.

### **3.2.1 Faculty level variables**

In the university under investigation there are five faculties: Sciences, Engineering Computer and Maths Sciences, Humanities and Social Sciences, Professions, and Health Sciences. As argued in Chapter 2, several institutional level factors have been found to influence student level attrition in past studies (Munro, 1981; Titus, 2004). Effects on student level attrition have also been noted as coming from faculty or school level variables within institutions in older studies (Iffert, 1958; McNeely, 1937) and in the Australian context as 'field of education' (Coates & Ranson, 2011; J McMillan, 2005). Field of education has also been shown to be a factor influencing institutional level attrition rates (Gabb et al., 2006).

Information and data from Faculty level variables are collected from university records.

### 3.2.1.1 *Faculty background characteristics*

#### Faculty size

While institution size has been postulated as a factor in the past (Pascarella, 1985; Titus, 2004), no known study has employed faculty size as a possible operational factor.

In this current investigation faculty size is assessed using two indicators:

- (a) total number of students within faculty year cohorts (F\_TSHC);
- (b) total number of so-called domestic students within faculty year cohorts (F\_DSHC).

#### Faculty composition

Similarly to assessments of size, past studies have also shown that institutional composition can have significant effects on student level attrition and other student level concepts (Franke, 2012; Titus, 2004, 2006a). No known study has postulated these compositional effects from the faculty level.

In this investigation faculty composition is assessed using two indicators:

- (a) the proportion of domestic low SES students within faculty year cohorts (F\_SES);
- (b) the proportion of male domestic students within faculty year cohorts (F\_GEN).

### 3.2.1.2 *Faculty peer group effects*

A focus of this investigation is peer group size, which is one of a possible number of other faculty group effects and the only one available for this investigation. While not measured as a factor influencing student attrition, peer group size at the faculty level has been suggested as one in the past, particularly for ethnic minority student attrition (Eimers & Pike, 1997; Gloria, 1997; Gloria, Robinson Kurpius, Hamilton, & Willson, 1999; Oseguera, 2005; Pascarella, 1985; Seidman, 2005; Sherman, Giles, & Williams-Green, 1994).

At the faculty level peer group size is assessed as:

- (a) the total number of students entering on the basis of completed VET qualification (VET entrants) within faculty year cohorts (F\_PGS).

### 3.2.1.3 *Faculty outcomes*

This investigation considers both performance and attrition or retention as outcome variables. Outcomes for students at the institutional level have been found to influence individual student level outcomes. Thus, outcome variables at the faculty level may also influence student level outcomes such as the student level attrition. No known study has suggested such factors.

In this investigation two faculty peer outcomes are investigated:

Faculty academic performance

This is assessed using one indicator:

- (a) faculty level year cohort GPA (F\_GPA).

Faculty retention

This is assessed using one calculated indicator:

- (a) faculty level year cohort apparent retention rate (F\_ARR).

## 3.2.2 *Program level variables*

In the university, 27 programs within the five faculties accepted VET entrants. As mentioned earlier, institutional level variables have been found to influence student level attrition in past studies (Munro, 1981; Titus, 2004). Effects at the lower school level within institutions are noted in two of the older major US studies reviewed in Chapter 2 (Iffert, 1958; McNeely, 1937) and in the Australian context as 'field of education' (Coates & Ranson, 2011; J McMillan, 2005). Program related class level variables have also been reported to be of influence to student level attrition (Stewart et al., 2013). It is postulated that the following program level variables at the university in this investigation influence the individual student's decision to drop out of the university. It is necessary to note that all program level variables are collected from university records and based on year cohorts.

### 3.2.2.1 *Program background characteristics*

Program size

Class size has been tested as a factor influencing student attrition on at least one occasion (Iffert 1958) and institution size has been postulated several times with various results (Napoli &



Wortman, 1998; Pascarella, 1985; Titus, 2004). No known Australian study has postulated program size as a possible factor.

In this investigation program size is assessed using one indicator:

- (a) total number of domestic students within program year cohorts (P\_DSHC).

#### Program composition

As previously mentioned, past studies have shown that institutional composition could have significant effects on student level attrition and other student level concepts (Franke, 2012; Titus, 2004, 2006a), but no known study has postulated these effects coming from the program level.

In this investigation, program composition is assessed using two indicators:

- (a) the proportion of domestic low SES students within program year cohorts (P\_SES);
- (b) the proportion of male domestic students within program year cohorts (P\_GEN).

#### Program selectivity

Institutional selectivity has been shown to have an influence on student level attrition (Oseguera & Rhee, 2009) and at the program level in the Australian context where it wasn't examined using multilevel procedures (Marks 2007). Thus, selectivity at the program level may also have an influence on a student's decision to withdraw.

Program selectivity in this investigation is assessed as:

- (a) the cut off score (tertiary entrance ranking) used for entrance to the program year cohorts (P\_TERCO).

#### 3.2.2.2 *Program peer group effects*

The possible effect of program level peer group size, the only available program peer group effects in this investigation, on student level attrition is discussed extensively in this and other chapters. Peer group size is a variable of interest for this study.

The program level peer group size is assessed as:

- (a) the total number of VET entrants within program year cohorts (P\_PGS).

### 3.2.2.3 *Program outcomes*

This investigation examines performance and attrition as outcome variables. Outcomes for students at the institutional level have been found to influence student level outcomes (Oseguera & Rhee, 2009). Outcome variables at the program level may also influence student level outcomes such as the student level attrition, but no study has postulated such factors.

In this investigation, two program outcomes are investigated:

Program academic performance

This is assessed using one indicator:

- (a) program level year cohort GPA (P\_GPA).

Program retention

This is assessed using one calculated indicator:

- (a) program level year cohort apparent retention rate (P\_ARR).

## 3.2.3 Student level variables

As discussed in Chapter 2, most factors that are identified in past Australian studies on student attrition have operated at the individual student level. In an effort to provide consistency and comparability, concepts from this level are operationalized, as far as possible, in the same or similar manner to previous studies. However, failure to take the nested structure of the data employed in previous Australian studies is a shortcoming of such studies. Thus, the following set of individual student level variables are postulated as influencing individual VET entrant student drop out from the university.

### 3.2.3.1 *Student background characteristics*

Student background characteristics have long been considered as having possible indirect effects on student level attrition (Bean & Metzner, 1985; Spady, 1970; Tinto, 1975). These background characteristics have been grouped into three categories: academic background; individual attributes; and external pressures.

Academic background

In this study, three variables of a student's academic background are investigated with regards to the possible effects of these variables on VET entrant student level attrition.

### Student academic ability

The most common ways of assessing student academic ability was through performance scores and rankings for student high school results and in academic admissions testing (Aitken, 1982; Braxton, Milem, & Sullivan, 2000; Davidson, Beck, & Milligan, 2009). In Australia, the high school Australian Tertiary Admissions Ranking (ATAR) is currently used by universities to select student's entry eligibility. This variable has been viewed as the most influential for academic success at university (Marks, 2007; J McMillan, 2005).

Student ability in this investigation is assessed using two indicators:

- (a) High school rank (HSR);
- (b) Special Tertiary Admissions Test rank (STATR).

### Qualification level

This investigation includes only students who have previously completed a VET qualification and used this for entry purposes. Thus, unlike the previous two indicators for ability, which are not available for each student, the concept of qualification level is included to obtain a possible indicator of ability and of progression on a student's level of academic skills and knowledge (Australian Qualifications Framework Council, 2011) available for all students included in this study.

Qualification level in this investigation is assessed as:

- (a) VET qualification level (VETQ).

### Study Gap

As a number of students included in this study are of an older age, it is possible that that the time spent away from academic activities is such that the gap in study can influence a student's outcomes. This has not been postulated in the Australian context.

In this investigation the study gap, in years spent away from the last formal education, is assessed using a single indicator:

- (a) Study gap (SG).

### Individual Attributes

Individual attributes have been posited as influencing subsequent mediating factors of student level attrition (Tinto, 1993), particularly for non-traditional students (Bean & Metzner, 1985). In this study, a number of these are assessed using both university records and survey items.

### Home State

In Australia, universities generally catered for the students in their own state (Long et al., 2006). Living far from the family home might mean that support from the family was weakened. This could influence a student's decision to withdraw.

Home state location, in this investigation, is assessed using a single indicator:

- (a) Student Home State (SO)

### Socio Economic Status Background (SES)

Students from a low SES background have been shown to be more likely to withdraw from university in an Australian context (Long et al., 2006). SES was assessed using a single indicator based on home address postcode (J McMillan, 2005).

In this study the student SES is based on quartiles and obtained from university records (SES).

### Gender

It was possible that gender could have an influence on student level attrition (Marks, 2007). Some researchers have contended that gender was a vital background variable that needed always to be examined and controlled for when considering attrition of non-traditional students (Bean & Metzner, 1985).

In this investigation, gender is assessed as a dichotomous variable (GEN).

### Age

Similar to gender, age has also been regarded as a vital background variable for non-traditional university entrants (Bean & Metzner, 1985), and has been found to be a possible factor influencing attrition in the Australian context (Long et al., 2006).

In this investigation age is assessed as a continuous variable that is collected from university records (AGE).

#### Language Background

Language background has been found to influence a student's decision to withdraw in Australian contexts (Long et al., 2006; McMillan, 2005).

In this investigation, it is assessed using an indicator taken from a survey item:

- (a) English-speaking background (ESB).

#### External Pressures

External commitments have been postulated as having an effect on student attrition (Bean & Metzner, 1985; Tinto, 1993) and found to have a significant effect in Australian contexts (Hillman, 2005; Long et al., 2006; McMillan, 2005). Two types of commitment are investigated in this study and are assessed using questions in the survey instrument (see Appendix 1: Questions 2-6):

#### Family Commitments

Family commitments have been measured using two indicators:

- (a) Partnered status (PS);
- (b) Number of dependents (DEP).

#### Financial Concerns

Financial concerns are assessed using two indicators:

- (a) Working hours per week (WHPW);
- (b) Financial Support (FS).

#### 3.2.3.2 *Student Entry Characteristics*

In past studies, student entry characteristics have been shown to influence student level attrition. This is particularly so in the Australian context, where, unlike in the US, they are also included in government higher education statistics on student retention (McMillan, 2008).

These entry characteristics can be viewed as belonging to two sub-categories:

### Enrolment Status

Enrolment status has been recognized as having an effect on student attrition (Bean & Metzner, 1985), and was included in Australian studies (Long et al., 2006).

Enrolment status is assessed in this study using two indicators:

- (a) Study load (FTR);
- (b) Admit semester (SEM). Note this variable assesses whether a student enters in the first or second semester of the academic year.

### Pre-Entry Institutional Commitment

Initial, or pre-entry, institutional commitment was a well-established concept often assessed in longitudinal studies of student attrition (Pascarella & Terenzini, 1979; Tinto, 1975).

In this investigation, it is assessed using two indicators obtained from university and state admission centre records:

- (a) University preference (UNIP)
- (b) Program preference (PROGP)

### Credit

In this investigation, one concept that is placed between the student entry characteristics category and the student experiences category is the credit received for prior VET studies. While all students in this investigation entered on the basis of a completed VET qualification, only a section of these students receive transfer credit for their VET studies. Credit at the university is not given automatically but needs to be applied for by each student. This is obtained, in most cases, after enrolment and includes some interaction with university staff. Credit received has been recognized as being very important in saving students both time and money (Long et al., 2006) but possibly also as having negative influences on academic objectives (Cram & Watson, 2008). It is therefore possible that this 'transfer' credit can influence a student's decision for remaining or withdrawing from university.

In this study, credit is assessed as to whether or not it is received in the first semester of study (TC).

### 3.2.3.3 *Student Experiences and Attitudes that are Emotional and Logical*

In this investigation, after a student begins his or her first studies at university, they can be perceived as having various experiences as they interact with the administrative and academic materials and with student peers and with a variety of university staff. From these experiences, students can also be seen as forming attitudes to the various aspects of university life. In addition, the individual has been postulated to process decisions through regions of the human brain connected to processing emotions or logic (Eagleman, 2015). In this investigation, this category thus includes these experiences and attitudes that are emotional or logical as they influence the eventual student outcomes.

#### Student Network Sizes

In this study network sizes in terms of the number of acquaintances, close friends, academic advisers, social advisers each student has is central to this investigation. These variables have much in common with Thomas' (2000, p. 603) 'clique size'. The five, so termed, student network sizes are assessed and data collected through the survey instrument (see Appendix 1: Questions 39-42) with one item for each of the following:

- (a) Peer student acquaintances (SN1);
- (b) Peer student close friends (SN2);
- (c) Peer student academic advisers (SN3);
- (d) Peer student social advisers (SN4).

#### Social Integration

University students have been assessed as integrating with the social environment of the university (Spady 1971, Tinto 1975). The concept of social integration has been found to be an influence on student level attrition (Braxton & Hirschy, 2004; Pascarella & Terenzini, 1983).

In this investigation this concept is assessed using two indicators (Hausmann et al., 2009), themselves indicated by five survey items (see Appendix 1: Questions 43-52):

- (a) Social Integration with Peers (SIP);
- (b) Social Integration with Staff (SIS).

### Perceived Educational Ability

Self-confidence and self-efficacy have been postulated as having an influence on performance and retention in educational contexts (Bandura, 1997; DeWitz, Woolsey, & Walsh, 2009; Lent, Brown, & Larkin, 1984) and have been shown to have an effect on university student outcomes (Davidson et al., 2009; Lent, Brown, & Gore, 1997).

In this investigation perceived educational ability is operationalized to be specific to the relevant outcomes. It is assessed as a single construct (PEA) indicated by six survey instrument items (see Appendix 1: Questions 22-27).

### Institutional Commitment

Institutional commitment has been a central concept of many studies of student attrition (Braxton et al., 2014; Nora & Cabrera, 1993). Its longitudinal nature and operationalization has been well documented (Braxton et al., 2004; Tinto, 1993) and applied in the Australian context (Long et al., 2006).

In this study, the concept of institutional commitment is employed using one latent indicator that is assessed using five survey items (see Appendix 1: Questions 12-16):

- (a) Institutional Commitment (IC).

### Institutional Membership

In addition, a sense of belonging to the university has been postulated and found to have a mediating effect on commitment and student level attrition (Hausmann, Schofield, & Woods, 2007; Hausmann et al., 2009).

In this study, the concept of institutional membership is employed using one latent indicator that is assessed using five survey items (Appendix 1: Questions 17-21)

- (a) Institutional Membership (IM).

One further concept is included in the research model under this category. It is a variable related to the logic assessments made by the brain and theorized to influence the decision to withdraw.



### Academic Efficiency

In this investigation, the concept of academic efficiency (AE) is devised from a biological evolutionary and neurological perspective (see Eagleman, 2015; Sumpter, 2006). It is operationalized and estimated using two concepts assessed by employing four or five survey items (see Appendix 1: Questions 34-38 and 30-33).

The concepts are:

- (a) Perceived Effort (PE);
- (b) Perceived Performance (PP)

Academic Efficiency is calculated as Perceived Performance divided by Perceived Effort.

#### 3.2.3.4 *Student Outcomes*

In this study, two student outcomes are assessed and investigated.

##### Performance

Student performance is assessed using a single indicator obtained from university records:

- (a) First semester GPA (GPA).

##### Drop Out

The second student outcome is the dependent variable for this investigation. This variable is dichotomous in nature with students either persisting or dropping out during their first year of studies. Student Drop Out is assessed using a single indicator:

- (a) Student non-enrolment into their second year of studies (DO)

##### Summary

The hypothesized structural model presented in Chapter 2 is advanced to form a research model presented in this chapter. The research model contains some concepts that are particular to this cohort of students including qualification level and credit received for prior VET studies. It also includes a student's sense of belonging to the university or 'institutional membership' as a mediating factor of a student's commitment to the institution. The model is of a multivariate and multilevel nature and structure, and is an advancement on previous Australian studies about university student attrition.

The model hypothesized is a causal path model that can be examined using several different types of statistical and stochastic analyses. Within the research model, several latent concepts are measured using multiple survey items: Perceived Educational Ability, Social Integration with Peers, Social Integration with Staff, Perceived Effort, Perceived Performance, Institutional Membership, and Institutional Commitment. In the following chapters, these variables are examined for strength and consistency and are evaluated in terms of validity and reliability. The next chapter, however, first deals with the study's methods of investigation.

**Table 3.1 Research Faculty and Program Level Factors, Variables and Measurements**

<b>Factors</b>	<b>Variables</b>	<b>Variable Code</b>	<b>Measurements</b>	<b>Data Source or Survey Item</b>
<b>Faculty Level</b>				
Faculty Size	Faculty Total Student Head Count	F_TSHC	Total number of students within a faculty	University Records
	Faculty Domestic Student Head Count	F_DSHC	Total number of domestic students within a faculty	University Records
Faculty Composition	Faculty low SES Proportion	F_SES	Proportion of domestic low SES students within a faculty	University Records
	Faculty Gender Proportion	F_GEN	Proportion of domestic male students within a faculty	University Records
Faculty Peer Group Size	Faculty VET Peer Group Size	F_PGS	Total number of VET entrants within a faculty	University & State Admission Centre Records
Faculty Peer Outcomes	Faculty GPA Average	F_GPA	Average GPA within a faculty	University Records
	Faculty Retention Rate	F_ARR	Apparent Retention Rate calculated from enrolment faculty numbers	University Records
<b>Program Level</b>				
Program Size	Program Total Student Head Count	P_TSHC	Total number of students within a program	University Records
	Program Domestic Student Head Count	P_DSHC	Total number of domestic students within a program	University Records
Program Composition	Program low SES Proportion	P_SES	Proportion of domestic low SES students within a program	University Records
	Program Gender Proportion	P_GEN	Proportion of domestic male students within a program	University Records
Program Selectivity	Program ATAR Cut Off	P_TERCO	ATAR cut off used for entry to a program	University Records
Program Peer Group Size	Program VET Peer Group Size	PGS	Total number of VET entrants within a program	University & State Admission Centre Records
Program Peer Outcomes	Program GPA Average	P_GPA	Average GPA within a program	University Records
	Program Retention Rate	P_ARR	Apparent Retention Rate calculated from enrolment program numbers	University Records

**Table 3.2 Research Student Level Factors, Variables and Measurements**

<b>Factors</b>	<b>Variables</b>	<b>Variable Code</b>	<b>Measurements</b>	<b>Data Source or Survey Item</b>
<b>Student Level</b>				
Student Academic Ability	Student High School Rank	HSR	Student ATAR	University & State Admission Centre Records
	Special Tertiary Admissions Test (STAT) Rank	STATR	Student STAT Ranking	University & State Admission Centre Records
Student Qualification Level	VET Qualification Level	VETQ	Highest VET qualification achieved by student	University & State Admission Centre Records
Student Study Gap	Study Gap	SG	Number of years between VET studies completion and university entry	University & State Admission Centre Records
Student Individual Attributes	Student Home State	SO	Student State of Origin	University & State Admission Centre Records
	Student SES	SES	Student SES based on home postcode	University Records
	Student Gender	GEN	Student gender	University Records
	Student Age	AGE	Student age in years in Jan in year of admission	University Records
	Language Background	ESB	Student English Language Background	Survey Item: 1
External Pressures	Partnered Status	PS	Student marital and partnered status	Survey Item: 2
	Dependents	DEP	Number of dependents	Survey Item: 3
	Working Hours per Week	WHPW	Number of hours per week of outside employment	Survey Item: 4, 5
	Financial Support	FS	Receipt of other financial support	Survey Item: 6
Student Enrolment Status	Student Study Load	FTR	Average GPA within a program	University Records
	Student Admit Semester	SEM	Semester first enrolled, First or Second	University & State Admission Centre Records
Pre-Entry Institutional Commitment	Program Preference	PROGP	Student Preference for Program admitted to	University & State Admission Centre Records
	University Preference	UNIP	Student Preference for the University	University & State Admission Centre Records
Credit	Transfer Credit	TC	Receipt of credit for prior studies within first year	University Records

**Table 3.3 Research Student Level Factors, Variables and Measurements  
(continued)**

Factors	Variables	Variable Code	Measurements	Source of Data or Survey Item
<b>Student Level</b>				
Student Network Sizes	Peer Student Acquaintances	SN1	Number of student acquaintances	Survey Item: 39
	Peer Student Close Friends	SN2	Number of student close friends	Survey Item: 40
	Peer Student Academic Advisers	SN3	Number of student friends giving academic advice	Survey Item: 41
	Peer Student Social Advisers	SN4	Number of student friends giving social advice	Survey Item: 42
Social Integration	Social Integration with Peers (SIP)	SI (SIP & SIS)	Five survey items measuring SIP	Survey Item: 43 - 47
	Social integration with Staff (SIS)		Five survey items measuring SIS	Survey Item: 48 - 52
Institutional Commitment	Institutional Commitment	IC	Five survey items measuring IC	Survey Item: 12 - 16
Institutional Membership	Institutional Membership	IM	Five survey items measuring IM	Survey Item: 17 - 21
Perceived Ability	Perceived Educational Ability	PEA	Six survey items measuring PEA	Survey Item: 22 - 27
Academic Efficiency	Perceived Performance (PP)	AE (PP & PE)	Four survey items measuring PP	Survey Item: 30 - 33
	Perceived Effort (PE)		Five survey items measuring PE	Survey Item: 34 - 38
Student Outcomes	First Semester GPA	GPA	First Semester GPA	University Records
	Student Drop Out	DO	Student non-enrolment into 2 <sup>nd</sup> year of studies	University Records

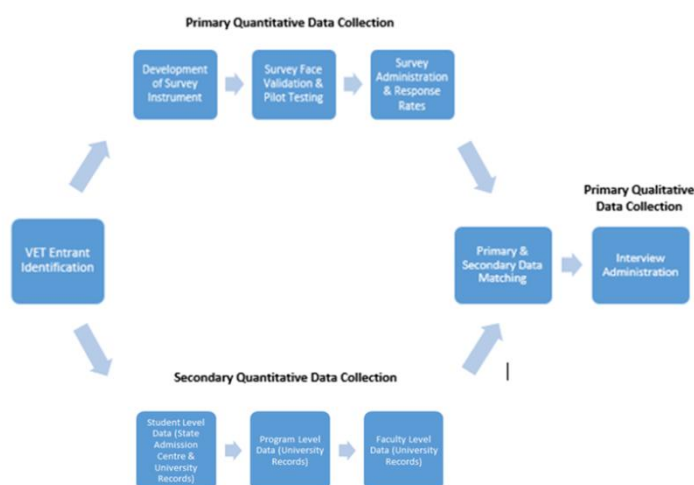
## 4 Methods of Investigation

This chapter deals with this study's methods of investigation. The methods used confront the problems raised by the inclusion of the concepts of 'program' and 'faculty' in the analysis of the data collected and by the problems associated with dealing with a binary or dichotomous final outcome variable. In this investigation the student's decision to Drop Out is, thus, considered as a binary outcome influenced by other student level variables, which are assumed to be nested within programs. In turn, the programs are assumed to be nested within faculties.

The chapter is divided into the methods used for data collection and the methodology for data analysis.

### 4.1 Primary and secondary data collection

As all data collection involves biases, this study endeavours to triangulate data from different sources and, to use different methods. Both primary and secondary data are collected in line with the research model concepts (Figure 3.1), and aim to address the stated research questions (section 1.3). Primary data are collected using a survey instrument developed for this study and through semi-structured interviews with a small sample of the VET entrants. Secondary data are extracted from the university and the state admission centre's records. Figure 4.1 illustrates the data collection process.



**Figure 4.1** The data collection process.

#### 4.1.1 VET entrant population identification

The VET entrant population for the university is stored in two separate data sets: one within the university records, and another within the state admission centre records. These records are different as the two organisations gather data for different purposes. The two VET entrant data sets are triangulated to identify the VET entrant population more accurately. Essentially, this process matches students who had applied to those that had entered. Using this data matching technique, a total of 543 students are identified to have entered the university on the basis of a complete VET qualification between 2005 and 2012. This number includes students who had entered for both single and double degrees.

Between 2005 and 2012, double degree entry was not as common as the traditional single degree admission. With regard to this investigation's focus on program and faculty level concepts, double degree entrants cannot easily be grouped. Double degree students had either entered two programs simultaneously or in sequence. Depending upon whether enrolling part-time or full-time, a double degree student might have started with either one of the degrees or with both.

Assigning these students to any one particular program was problematic. Some of the double degrees combined programs from different faculties. Thus, faculty identification is also problematic. Furthermore, a double degree entrant has more options in terms of withdrawal. They may decide to withdraw from one program and not the other, or they may withdraw from both programs. The decision to withdraw for a double degree entrant is therefore a more complex decision than it is for a single degree entrant. Thus, attrition may be a different process for single and double degree entrants. For these reasons, double degree entrants are excluded from the analysis. This process removes 32 students and this results in a final total population size of 511 students entering the university as a single degree entrant on the basis of a VET qualification (VET entrants).

#### 4.1.2 Secondary quantitative data collection

Data for each of the 511 VET entrants is then gathered from a second wave of searches of the university and state admission centre data sets that are consistent with variables in the research model (see Figure 3.1). This 'population data' data allows comparisons to be made with the survey respondent sample.

The following student level data are gathered directly from the state admission centre records:

- a) student Australian Tertiary Academic Rank (ATAR),
- b) student Special Tertiary Admission Test (STAT) ranking,
- c) Vocational Education & Training (VET) qualification level,
- d) program preference, and
- e) university preference.

The following student level variable data are gathered directly from the university records:

- a) student socio-economic status (SES) (based on postcode);
- b) student gender;
- c) student age;
- d) student study load;
- e) semester student admitted;
- f) student transfer credit;
- g) student first semester Grade Point Average (GPA);
- h) student 'drop out' status.

Data gathered from the university records includes which program and faculty each student first entered. Students from all five faculties and from 27 separate programs are identified.

Aggregated data on the five faculties and on the 27 programs are then gathered directly from university records for all but two of the variables at the second and third levels of the research model. These are based on yearly cohorts and include:

- a) faculty total student head count;
- b) faculty domestic student head count;
- c) faculty domestic low SES student ratio;
- d) faculty domestic male student ratio;
- e) faculty domestic student average GPA;
- f) program total student head count;
- g) program domestic student head count;
- h) program domestic low SES student ratio;
- i) program domestic male student ratio;
- j) program domestic student average GPA.



Faculty and program retention rates, also known as apparent retention rates (see Australian Government, 2004; Long et al., 2006), are calculated from faculty and program enrolment data, collected from university records, using the following formula for apparent retention rates (ARR) (the example given is for 2012):

$$\text{ARR (for 2012-2013)} = \frac{2013 \text{ Continuing Students}}{(2012 \text{ Total Students} - 2012 \text{ Completions})}$$

Faculty and program peer group sizes, variables of particular interest to this investigation, are obtained by aggregating VET entrant student numbers based on the whole population size of 511 students that is found from the triangulation of university and state admission centre student level data described in section 4.1.1.

#### 4.1.3 Primary quantitative data collection

In order to capture primary data on student level concepts included in the research model that cannot be assessed using available secondary data, a survey is developed for the VET entrants based, where appropriate, on a number of previous studies. The survey (see Appendix 1) is designed to obtain data on: individual student attributes; academic background; external pressures; student experiences and attitudes that are emotional and logical; and student outcome perceptions during the first year of enrolment.

The survey is divided into seven sections. The first section is designed to gather data on student background characteristics. These include: language background, family and work commitments, financial support details, and academic background details. This section also includes an open-ended question asking for the student's reasons for withdrawing from studies. The second section is designed to obtain students' institutional commitment. The third section asks students to assess their confidence in their own abilities to study effectively. The fourth section assesses the students' perceptions of their performance. The fifth section asks students to assess the amount of effort that the students had put into their studies. The sixth section asks students to estimate student network sizes. The last section assesses students' social integration. One final question is included to recruit students for the semi-structured interview phase.

The survey instrument is initially prepared for acceptance by the supervisors and by the Low Risk Human Research Ethics Review Group (Faculty of Humanities and Social Sciences and the

Faculty of the Professions) at the university. The draft of the survey is included within the ethics application lodged on 10 September 2013, which receives approval on the 22 October 2013 (see Appendix 2).

The survey draft is pre-tested with five postgraduate students at the university. This is done for face validity purposes: to assess clarity in expression, comprehensiveness, and length. The postgraduate students are asked to respond to the survey as well as to comment on the three face validity aspects. The survey draft is also handed to one expert in the field of university student exit surveys, who is asked to make any comment or suggestion to improve the effectiveness of the survey. Following this face validation process, additional questions are added to the first section of the survey in order to assess family and work commitments and financial circumstances. A revised draft of the survey is, thus, produced.

This revised draft of the survey is then pilot tested. The opportunity is taken to examine the revised survey with some of the students attending a university preparatory program (UPP), that is, a course taught and coordinated by one of the supervisors of this research study. The UPP students are considered to be particularly appropriate for this pilot test. The UPP is, much like the VET entry pathways, an alternative pathway for undergraduate admission to the same university where this study is based. The UPP students are also, much like the VET entrants, non-traditional in age and academic background. The UPP class is approached with an information sheet concerning the research and the students are invited to take the revised survey at an assigned time in a classroom within the university. Lunch is provided as an incentive to participate. Five UPP students volunteer, fill out the survey and provide feedback regarding the clarity of the survey items. The survey is, thus, further revised and finalized. This final version of the survey is then prepared and administered to the 511 VET entrant population.

As discussed earlier, participation rates for research on attrition have historically been low, particularly so in Australia. Response rates from withdrawn students in these past studies have been invariably low. In this investigation, many of the students had already left the university, either because they had graduated or had withdrawn. In an effort to maximize the response rates in this study, the survey is administered in two ways and prospective participants can choose either method to respond. Small prizes, one \$100 voucher, and five \$20 vouchers, are also offered in a prize draw for all those who respond to the survey within a month of its release.

The survey is administered electronically through the 'survey monkey' facility and through the normal mail system on 13<sup>th</sup> February 2014 to all 511 students in the VET entrant population. The survey is accompanied by information sheets providing details of the study, further contact information, and the complaints procedure, if needed (see Appendix 3). Response to the survey, as explained in the survey information sheet, is taken as consent to participate in the study. University email addresses are used for students still enrolled and personal email addresses, as recorded in university records, are used for students who had already left the university. All emailed and mailed surveys are coded, to rule out any student who responds more than once. For the three students who respond by both mail and online only their first response is used for analysis. Reminder emails are sent on two occasions to improve response rates.

Response rates for the survey are recorded in Table 4.1. Of the 511 VET entrant population, responses are received for a total of 140 students. The response rate for the survey is 27.4 per cent. Of the responses, 82 are received electronically and 58 are received through the mail. Of the 140 responses, 135 are complete and 26 of the 140 responses (18.6%) are from students who had withdrawn during the first year of their studies. The other 113 responses are from students who had persisted past the first year.

**Table 4.1 Survey Response Rates**

Response Type	Frequency	Percent
Online Response	82	16
Mail Response	58	11.4
Total Response	140	27.4
No Response	371	72.6
Total	511	100

#### 4.1.4 Primary and secondary data matching

Data gathered using the survey for each of the 140 respondents is then matched to the secondary data searches described in section 4.1.2. This results in the complete set of student level data for the 140 survey respondents in line with the research model (see Figure 3.1).

The following data are matched with state admission centre records for the 140 survey respondents: student ATAR, student STAT ranking, VET qualification level, program preference,

and university preference. The following variable data are gathered from the university records: student SES (based on postcode), student gender, student age, student study load, student admit semester, student transfer credit, student first semester GPA, and student drop out status. Data matched from the university records includes which program and faculty each survey respondent first entered. Students from all five faculties and from 21 of the 27 separate programs are identified as having responded to the survey. Data on the five faculties and on the 21 programs are then gathered consistent with the second and third levels of the research model.

#### 4.1.5 Primary qualitative data collection - interview administration

In order to gather further primary data, interviews are held with a subsample of VET entrants that responded to the survey. Interviews allow survey response confirmation as well as the collection of primary data that cannot be gathered from the survey, from students choosing from Likert style question formats or from responding to the limited open-ended questions that are in the survey instrument (see Zumburum, 2014).

The last question in the survey is designed to recruit students for the semi-structured interview. Of the 140 survey respondents, 74 (52.9%) indicate that they are available for an interview. Time and resources restricted this phase to an interview with only 10 students. The 74 available, survey respondents are sent follow-up emails and letters, inviting the students to a one-hour interview conducted at the university (Appendix 4). The prospective interviewees are, also, sent information regarding the interview details and consent forms (see Appendix 4) on the 23<sup>rd</sup> of June 2014. Of those who respond favourably, 10 are selected. As is consistent with the nature of the survey, five students who had withdrawn and five students who had persisted are selected for interview. In order to widen the number of factors of attrition discussed in the interviews an attempt is made to balance interviewee attribute variables in terms of gender, age, VET qualification level, program peer group sizes and year and semester of admission. The interviewee student attributes are recorded in Table 4.2.

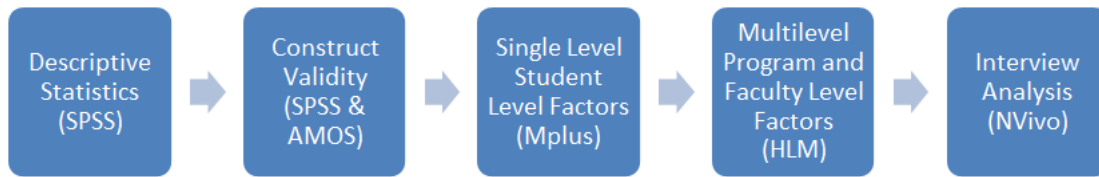
**Table 4.2 Interviewee Attributes**

Interviewee	Dropout Status	Gender	Age	VET Qualification Level	Peer Group Size	Year of Admission	Admit Semester
Interviewee 1	Persisted	Female	35	Advanced Diploma	4	2009	2
Interviewee 2	Persisted	Male	27	Certificate IV	6	2012	1
Interviewee 3	Persisted	Female	22	Certificate IV	14	2010	1
Interviewee 4	Persisted	Male	55	Certificate IV	4	2005	1
Interviewee 5	Persisted	Female	43	Advanced Diploma	5	2011	1
Interviewee 6	Withdrew	Male	27	Certificate IV	16	2012	1
Interviewee 7	Withdrew	Female	28	Diploma	16	2012	1
Interviewee 8	Withdrew	Male	38	Diploma	8	2008	1
Interviewee 9	Withdrew	Female	43	Diploma	6	2011	2
Interviewee 10	Withdrew	Male	23	Advanced Diploma	4	2009	2

A draft of the interview questions is made for ethics purposes and to guide discussion during the interview (see Appendix 5). Changes are made in an effort to personalize each interview prior to each interview meeting. The interviews are conducted at the university in a private office at an agreed time. Interviewees are each given a \$20 voucher to compensate for their time and effort. The 10 interviews take place between 30<sup>th</sup> June and 22<sup>nd</sup> July 2014. At each session prior to each interview, the study information sheet is re-issued and consent is reconfirmed, using the consent form previously sent by mail to each interviewee (see Appendix 4). During the interview, the discussion is guided by the pre-prepared questions, with diversions encouraged as students raise points of interest. The resulting 10 one-hour interviews are recorded and transcribed verbatim, with the aid of the Dragon 11.0 transcription software.

## 4.2 Data analysis

The data collection phase generates data of a quantitative and qualitative nature, which are coded and analysed in different ways. The advent of the computer has facilitated accurate and fast measurement and computation of statistical analyses. The data analysis for this investigation is undertaken with the aid of several appropriate computer software programs. The data analysis phase for this study, like the data collection phase, can be viewed as a process, that is illustrated by the Figure 4.2.



**Figure 4.2 The data analysis process.**

Software programs are selected because of their documented strengths in dealing with particular types of data and with the nature of the output obtained.

#### 4.2.1 Descriptive Statistics (SPSS)

Before embarking on inferential statistics, a study needs to illustrate clearly the nature of each assessed variable in general descriptive terms. In quantitative terms, each variable can be identified using descriptive statistics.

The SPSS program is employed to obtain descriptive quantitative statistics for each of the variables assessed by the secondary data and by the closed-ended survey items used in this investigation and documented in the research model. These variables can be divided into manifest or observed and unobserved or latent variables. The observed variables can be further divided into either continuous or categorical variables in nature.

The observed categorical variables, at the student level, used in this study are: VET qualification level; home state; student SES; gender; language background; partnered status; financial support; admit semester; program preference; university preference; transfer credit; and drop out status. The observed continuous variables, at the student level, used in the study are: high school rank (ATAR); STAT rank; study gap; age; number of dependents; working hours per week; study load; all student network sizes; and first semester GPA. Additional attitudinal questions with five-point Likert responses are used to assess the following seven latent variables: institutional commitment; institutional membership; social integration with peers; social integration with staff; perceived ability; perceived effort; and perceived performance. While the multilevel process nests the variables within each group, in this study either program or faculty, all program level and faculty level variables are of a continuous nature. The nature of the variables assessed in this investigation are summarized in Table 4.3.

**Table 4.3 Nature of Variables Assessed**

Categorical Variables	Continuous Variables	Latent Variables
<u>Student Level</u>	<u>Faculty and Program Level</u>	<u>Student Level</u>
VET qualification level	all variables	institutional commitment
home state	Student Level	institutional membership
student SES	high school rank (ATAR)	social integration with peers
gender	STAT rank	social integration with staff
language background	study gap	perceived ability
partnered status	age	perceived effort
financial support	number of dependents	perceived performance
admit semester	working hours per week	
program preference	study load	
university preference	acquaintance network size	
transfer credit	friend network sizes	
drop out status.	personal adviser network size	
	academic adviser network sizes	
	first semester GPA	

The SPSS program handles both sets of the observed variables and, in terms of descriptive statistics, produces appropriate charts and tables containing values for mean, standard deviation and standard error for continuous variables and frequency counts for categorical variables.

#### 4.2.2 Reliability and Construct Validity (SPSS & AMOS)

An instrument aims to measure or quantify a specific phenomenon. The instrument is considered to be reliable if it measures the phenomenon consistently. The instrument is valid if it measures the phenomenon it professes to measure. Reliability is intrinsically linked to validity as one cannot occur without the other. The data gathered in this investigation are divided into observed and unobserved variables. The observed or manifest variables in this investigation are treated separately and are assumed to each measure a more tangible phenomenon, such as GPA or age. There are limitations to some of the observed measures. For example, James et al (2008) noted that socio-economic status (SES), assessed in this investigation using a single postcode measure, is limited with respect to both its reliability and validity. Other measures for SES are unavailable for the period under investigation. Thus, the observed variables, including SES, are assumed to be adequately reliable and valid for use in this study.

The unobserved or latent variables are assessed using various items in the survey designed to indicate the particular latent variable or construct. In order to assess the reliability and validity of the items used to obtain the seven latent constructs involved in this investigation two software

programs, SPSS and AMOS, version 20, are used. Ho (2014) argued that reliability was a 'prerequisite' of validity. The process used for each latent construct is, then: to perform reliability testing of the items; the reliability testing is then followed by confirmatory factor analysis to confirm the validity of the factor solutions suggested by the reliability analyses.

The following student level variables with their corresponding survey items (in brackets) are assessed in this way, for reliability and validity:

- a) institutional commitment (five items)
- b) institutional membership (five items)
- c) perceived educational ability (six items)
- d) perceived performance (four items)
- e) perceived effort (five items)
- f) social integration with peers (five items)
- g) social integration with staff (five items).

The last of two 'social integration' constructs are assessed as being composed of two separate latent constructs, numbered or as one single latent construct: social integration (10 items).

SPSS, version 20 (IBM Corporation, 2011), is used to assess the reliability of items in measuring the related latent constructs. First, a correlation matrix is produced for all items measuring a construct (see Ho, 2014). This, inter-item correlation matrix, indicates the consistency between the items and the amount of variance explained by each of the items. Additionally, the Cronbach Alpha calculation for all items within a scale, available in the SPSS, version 20, program, is used to assess the overall internal consistency of the construct as measured by all the items. The Cronbach Alpha is a single correlation coefficient, estimating the average of all the correlation coefficients within a test (see Ho, 2014).

Following the reliability analyses, the items in the survey assessing latent constructs are subjected to confirmatory factor analysis (CFA) for construct validity purposes. In this investigation the AMOS program, version 20 (Byrne, 2010), is used. The items are combined to indicate the latent variable using the structural equation model procedure. This method of factor analysis is used for several reasons. AMOS takes: (a) a confirmatory approach to data analysis; (b) it is a more accurate procedure as it accounts for the residual error in its calculations; (c) the



factor score weights, that are used to calculate the 'Academic Efficiency' construct, are reported; (d) its graphical approach makes it an easy tool to use.

Jöreskog (1993 cited by Byrne, 2012, p. 8) recognized three basic strategies in testing structural equation models: strictly confirmatory, alternative models, and model generating. In the strictly confirmatory strategy, a researcher postulates a single model based on theory, which is then tested. Depending upon the results, the model is, either, rejected or failed to be rejected. In the alternative models strategy, the researcher postulates several models all based on theory. These models are then tested and the researcher selects the most appropriate from the original set as representing the study data. In the model generating strategy, the researcher postulates a hypothetical model based on theory. After testing and the rejection of the first hypothetical model, the researcher modifies and re-estimates the model, in an exploratory fashion. The re-estimation can be theory driven when modifications made have theoretical backing. In this investigation to perform CFA, the alternative models approach is used.

In order to perform CFA, the AMOS program calculates factor loadings for the connected items and various goodness of fit indices, which help to assess the alternative latent factor models. The seven latent constructs assessed are: institutional commitment, institutional membership, social integration with peers, social integration with staff, perceived educational ability, perceived performance, and perceived effort.

#### 4.2.3 Single level student level factors (Mplus)

This investigation uses the process of model analysis or 'modelling approach' advanced by Nordin, Keeves and Darmawan (2013). In this approach, a model is advanced so as to assess both the adequacy of the model and its usefulness and strength in providing an explanation from the theoretical perspective which underlies the model. The models are represented using path diagrams with straight lines indicating effects with arrow heads indicating the cause-to-effect direction. Mathematical equations, which can be statistically tested, underlie these pictorial representations. Such structural models can never be verified as 'true', as further evidence becomes available that may require a previously accepted model to be rejected.

In order to assess the hypothesized influences of the various observed and latent constructs represented in the research model, the Mplus, version 7 (Muthen & Muthen, 1998-2012),

computer program is used. Mplus is a software program, which uses a structural equation modelling (SEM) approach to investigate a set of causal paths to one or more dependent variables. Byrne (2012, p. 3) (2012 p.3) described SEM as having two important aspects: (a) that the causal relationships could be represented by a series of regression equations, and (b) that these relationships could be represented pictorially to clarify conceptualization and interpretation. Mplus and SEM in general have several advantages over the older multivariate procedures such as multiple regression and logistic regression. As factors are placed initially in SEM, the procedure has a confirmatory, inferential nature rather than an exploratory one. SEM techniques, unlike traditional multivariate analyses, account for measurement error in their calculations. Logistic regression techniques, for example, assume that errors in the independent variables do not exist, thus resulting in inaccuracies, especially when errors are sizeable. Whereas traditional multivariate procedures use only observed variables, SEM procedures can also incorporate both observed and unobserved (latent) variables in the analyses. In educational research, it is generally necessary to control statistically using mathematical means rather than experimental means. SEM software programs are able to simultaneously assess the variables in the hypothesized model, using mathematical controls, and estimate to what extent it is consistent with the data. SEM also generally uses maximum likelihood (ML) procedures for calculating model parameters rather than the least squares (LS) method, which is generally used by traditional regression methods. ML is generally accepted as a more robust and flexible method of generating model parameters.

The Mplus, version 7, program has been recognized as being both flexible and comprehensive in its analytical techniques and procedures to assess different kinds of structural models (Nordin et al., 2013). Mplus, version 7, has advantages over AMOS, version 20, the other SEM computer program used in this study for EFA and CFA. Mplus, version 7, has the capacity to assess models, which incorporate observed variables that are based on continuous or categorical (and in particular dichotomous for this investigation) data. A dichotomous dependent variable or outcome, such as the one used in this investigation, can also be assessed. Student drop out is measured in this study as either 'dropped out', or 'persisted', and is a dichotomous variable.

As noted earlier on the previous page there are three basic strategies in testing structural equation models: strictly confirmatory, alternative models, and model generating. Jöreskog (1993 cited by Byrne, 2012, p. 8) noted that the objective of the model generating strategy was to find a

statistically well-fitting and theoretically meaningful model. Byrne (2012) noted that this latter strategy was the most commonly used strategy, due mainly to the costs of collecting data. In this research study, the model generating strategy is used to identify a well-fitting theoretically meaningful single level model. In order to modify and re-specify models, modification indices (MI), expected parameter changes (EPC) values are used as described by Wang & Wang (Wang & Wang, 2012, p. 23).

For clarity purposes, the AMOS drawing facility is used to draw the student level models, as the Mplus drawing is not as well developed.

In order to investigate influences to student attrition from the second level factor program 'peer group size' a multilevel analysis was attempted using Mplus. Using the modelling approach and model generating strategy a model could not be tested with more than one causal line generating from the second level as the program stopped functioning past this stage.

#### 4.2.4 Multilevel Model: student, program and faculty level factors (HLM)

In order to address the research questions, student attrition is conceptualized as a multilevel problem. This study uses hierarchical linear modelling procedures using HLM, version 6 (Raudenbush, Bryk, Cheong, & Congdon, 2004), which is able to address multilevel analyses. As Darmawan and Keeves (2009) pointed out, it was inappropriate to pool students from different classes or schools into a combined group when there was evidence of differences between classes or schools in the criterion variable (in this investigation student attrition). Darmawan and Keeves (2009) suggested that these issues were necessarily addressed by a multilevel framework involving three levels. Titus (2004) similarly emphasized the need for using these methods when considering university student persistence and attrition. Student level attrition is conceivably influenced by factors coming from other levels. One of these is a major focus of this investigation. Peer group sizes are conceived to be taking place at the program and faculty levels. Titus (2004, 2006) considered whole institution racial or ethnic group ratios in his investigations. This concept can readily be applied to the program level, where most interaction between students takes place.

Using single-level statistical techniques on multi-level data can result in underestimating standard errors. Titus (2004) claimed that these underestimates may have increased the likelihood of

falsely finding statistically significant parameters (i.e., a Type I error). HLM also uses superior estimating techniques. As Titus (2004) described, the maximum likelihood methods of estimation, used by HLM, generally resulted in robust, and consistent parameters when used with large samples with unequal group sizes.

Before embarking on the multilevel analysis in this investigation, the amount of variance associated with the program level and with the faculty level are assessed. As Titus (2004) suggested a sufficient amount of variance needed to be shown between the groups at the higher level in persistence or attrition. In this investigation this is done by the calculation of Intra-Class Correlation (ICC), a measure often used to report levels of variability between higher level groupings.

Because the outcome or dependent variable is dichotomous or binary, the Bernoulli function in HLM is used. The same function is applied when using the traditional logistic regression, which deals with binary outcomes, as opposed to traditional multiple regression, dealing with continuous outcomes, where no Bernoulli function is applied and the dependent variable is simply regressed on the independent variables. The operation of the HLM program involves several stages. In the first stage, the natural log of the odds ratio (the Bernoulli function) of the dependent variable (student attrition) is regressed on the student level independent variables. At the second stage, the estimated structural or regression variables from the student level stage are regressed on the program level independent variables, including peer group size. As Darmawan and Keeves (2009) explained, the variance of the regression coefficients was partitioned into variance due to the parameter and to variance due to error. This error compensation allows for a more accurate estimation of program level effects. This treatment is extended to the faculty level in a similar fashion. Raudenbush et al (2004) referred to the second (program) level and third (faculty) level analyses as HLM6/2L and HLM6/3L respectively. As is done for the single (student) level model, the modelling approach and model generating strategy are used to search for well-fitting theoretically meaningful two level and three level models.

#### 4.2.5 Interview analysis (NVivo)

In order to analyse the comments made by the students during the 10 interviews, interview transcripts are imported into the NVivo, version 10, software program. Text is analysed and coded using themes as groupings (see Creswell, 2014, pp. 247-251) with the help of the NVivo

coding functions. Quotes from the interviews, thus provide narrative evidence for each theme. As the qualitative analysis plays a supportive role to the quantitative analysis, this style of thematic analysis stops at 'description and themes' (Creswell, 2014, p. 251).

Nine 'major' themes are defined prior to coding using the prepared interview schedule for the interviews. These initial themes are generally aligned to constructs represented in the research model and reflected on the interview schedule (Appendix 5). Particular attention is paid to the themes associated with 'peer group and student network sizes'.

Each of the nine major themes has at least two 'subthemes' reflecting positive and negative aspects for each major theme. The first interview is then coded using the nine initial major themes. After the first coding of the first interview, one more major theme emerges. This additional theme is added to the first interview and the resulting 10 major themes are applied to the second interview. All 10 interviews are then coded in a first iteration. After reflection, several more major themes are added. The 10 interviews are reread through and additional codings are made after the second, third and fourth iterations. In total 15 major themes emerge from the four iterations, each containing multiple quotes or excerpts from the 10 interviews.

### Summary

In this chapter, the data collection and data analysis processes are explained and discussed. In order to investigate the research for this study, both primary and secondary data are collected. Secondary data are collected from university and state admission centre records. Primary data are collected using a survey and follow up interviews. The data analysis process includes a combination of quantitative and qualitative analyses. Contemporary computer software programs are used to facilitate the analyses. Particular programs are selected because of their strengths in dealing with the nature of the data and the variables that are examined in this investigation.

# 5 Research Instruments: Reliability and Confirmatory Factor Analyses

## 5.1 Introduction

The research model (presented in Figure 3.1) proposes that there are four latent variables, which directly and indirectly influence whether VET entrants persist or drop out during their first year of university studies. These are: social integration; institutional commitment; institutional membership; and perceived ability. Two other latent variables are also assessed that are used in this study to form the measure for the manifest construct named 'academic efficiency' (see research model Figure 3.1 on page 93). These are: perceived performance; and perceived effort. The academic efficiency variable is also hypothesized to influence whether VET entrants drop out.

In this study, the latent variables are assessed, for the VET entrant survey respondents, using 35 survey items. This chapter investigates the reliability and validity of these 35 items in assessing the above-mentioned latent variables. A measure, or an item in this case, is 'reliable' if it can consistently produce similar results when assessing a concept. A measure, or item, is 'valid' if it assesses what it sets out to assess conceptually. Field (2009) explained these terms in more detail indicating that 'content validity' referred to the content of the item matching the content of the latent construct and that 'criterion validity' referred to the "evidence that scores from an instrument correspond with or predict external measures conceptually related to the measured construct" (Field, 2009, p. 873). Reliability and validity are intrinsically connected and any item conceived to measure or assess some phenomenon or attribute, needs to be both reliable and valid. As Ho (2014, p. 287) explained, 'it [reliability] is a prerequisite for the validity of a test'.

Thus, for each of the above-mentioned latent variables, the reliability of the items used to measure the latent structures are initially assessed using Cronbach alpha values. These are calculated using the SPSS, version 20, computer software program (IBM Corporation, 2011). Cronbach alpha is a single correlation coefficient that estimates the average of all the correlation coefficients of the items hypothesized to measure a latent variable. Notwithstanding Cronbach's own recent reservations of using coefficients for reliability testing (Cronbach & Shavelson, 2004),

this index has been used extensively in item internal consistency investigations. Within this investigation, Cronbach alpha is one of several indicators used to verify the survey instrument and the items within it. A high Cronbach alpha value (0.80 or above) indicates that the reliability and the internal consistency of the items are high. A low alpha value indicates that at least one of the items is unreliable. Item analysis are, then employed on the items to identify the so-called 'problem' items (see Ho, 2014). For items used to indicate new previously untested latent factors a more lenient cut off value of 0.7 (to one decimal place) is used (see Peterson 1994), particularly for items that reflect meaningful content coverage of the latent variable being indicated (Schmitt 1996).

After the reliability assessment, the survey items are assessed in terms of validity. Factor analyses are employed on the different groups of items, which are hypothesized to measure the different latent variables. Used in this manner to examine the underlying structure of the measure, factor analysis has been identified as an appropriate procedure to assess the overall validity, and more specifically the content validity, of survey item groups (Darmawan, 2003). Specifically, confirmatory factor analysis (CFA) is employed on the survey item groups using Structural Equation Modelling (SEM) with the AMOS, version 20, software program (Byrne, 2010). SEM techniques have a confirmatory nature and are thus useful CFA tools. The AMOS program is also used to calculate factor score weights for the perceived performance and perceived effort items, needed for the calculation of the 'academic efficiency' construct.

The survey items tested, in terms of reliability and validity, are grouped under the latent variables they are postulated to assess. The Social Integration construct is assessed as being interpreted as either one or two constructs. Two other closely related constructs, Institutional Commitment (IC) and Institutional Membership (IM), are similarly assessed as being interpreted as either one combined construct or two separate constructs. Thus, reliability testing and confirmatory factor analyses are employed on the following latent constructs:

- 1) Social Integration tested as a combination of one or two subcomponents, namely, Social Integration with Peers (SIP) and Social Integration with Staff (SIS);
- 2) Institutional Commitment and Membership (ICM) as a combination of one or two subcomponents, namely, Institutional Commitment (IC) and Institutional Membership (IM);
- 3) Perceived Educational Ability (PEA);

- 4) Perceived Performance (PP);
- 5) Perceived Effort (PE).

## 5.2 Social Integration scales

In order to investigate Social Integration, the study uses five items assessing Social Integration with Peers (SIP) and a further five items assessing Social Integration with Staff (SIS). Table 5.1 records the 10 Social Integration items that are used in the survey instrument for this study (see Appendix 1).

**Table 5.1 Social Integration Instrument Subscales**

Subscales	Item Label	Nature of item	Reverse scoring	Item Text
SIP	sip1	Positive	None	The student friendships I had in my first year at this university were personally satisfying
	sip2	Positive	None	I developed close personal relationships with other students in my first year at this university
	sip3	Positive	None	My personal relationships with other students had a positive influence on my attitudes and values in my first year at this university
	sip4	Positive	None	My personal relationships with other students had a positive influence on my interest in ideas in my first year at this university
	sip5	Negative	sip5R	It was difficult for me to meet and make friends with other students in my first year
SIS	sis1	Positive	None	My non classroom interactions with academic lecturing staff had a positive influence on my attitudes and values in my first year at this university
	sis2	Positive	None	My non classroom interactions with academic lecturing staff had a positive influence on my interest and ideas in my first year at this university
	sis3	Positive	None	My non classroom interactions with academic lecturing staff had a positive influence on my career goals and aspirations in my first year at this university
	sis4	Positive	None	I was satisfied with the opportunities to meet and interact with academic lecturing staff members in my first year at this university
	sis5	Positive	None	I developed personal relationships with at least one university administrative staff member in my first year at this university

The 10 Social Integration items have a five-point Likert scale response structure, with only the 'endpoints' labelled (see Appendix 1, Questions 43-52). In all 10 items, the respondents are asked to what extent they agree with the item statement. The two endpoint labels used are 'strongly disagree' and 'strongly agree'. These 10 items can be interpreted as contributing to a single Social Integration scale of 10 items, or to two subscales, SIP and SIS, each having five items. One of the 10 Social Integration items is of a negative nature. This item, sip5, is negatively



recoded, sip5R, to match the direction interpreted by the other nine items. Of the 140 respondents, five did not complete this section of the survey.

**Table 5.2 Social Integration Survey Responses**

Survey SI Responses	N	%
Responded to all Social Integration Items (10 items)	135	96.4
Did not respond to all Social Integration items	5	3.6
Total Survey Respondents	140	100

This is stated in Table 5.2, which records that 135 (or 96.4%) of the 140 respondents answered all 10 Social Integration items. Missing data, for these five non-respondents, is not used for the first part of the reliability and validity testing. The second part of the analysis, when error terms are correlated with the aid of Modification Indices (MI's), requires a full data set (with no missing values). In this case, the missing data, for the five non-respondents, are replaced, using item mean scores, in the linked file using the corresponding function in the SPSS program (see Byrne, 2010).

### 5.2.1 Social Integration reliability testing

In order to assess the reliability and validity of the 10 Social Integration items used, the survey responses to these items are analysed using the SPSS program. Cronbach's alpha measures and 'Inter Item' correlations are calculated. The Cronbach's alpha for the 10 items is 0.87, which indicates high overall internal consistency between the items. The results of the Inter Item analysis are recorded in Table 5.3. The table records values of the scale mean, variance, and the Cronbach alpha value if each of the 10 items is removed. The table, also, records the corrected item-total correlation and squared multiple correlation for each of the 10 Social Integration items.

The corrected item-total correlation, seen in Table 5.3, assesses the consistency between the items. The results indicate that all 10 items can be retained. The lowest 'corrected item-total correlation' value is that calculated for the item 'sip5R'. This value is 0.37, which is above the cut-off value of 0.33 (approximately 10% of scale variance accounted for) used to retain items (see Ho, 2014, p. 292). Thus, this preliminary reliability assessment indicates that all 10 Social Integration items can be retained, in terms of their reliability, in measuring the single Social Integration construct. The least reliable of the items, as indicated by this reliability assessment, is

the only negatively coded item, 'sip5R'. Following this assessment, an assessment is made of the validity of the 10 items in measuring the Social Integration construct.

**Table 5.3 Social Integration Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
sip1	26.70	59.20	0.70	0.71	0.85
sip2	27.35	58.99	0.62	0.72	0.85
sip3	26.90	57.81	0.70	0.81	0.85
sip4	27.04	59.99	0.66	0.69	0.85
sip5R	26.98	64.07	0.37	0.27	0.88
sis1	26.67	61.73	0.61	0.73	0.85
sis2	26.69	62.44	0.57	0.77	0.86
sis3	26.80	62.07	0.61	0.68	0.86
sis4	26.66	63.73	0.54	0.45	0.86
sis5	27.56	61.13	0.51	0.36	0.86

### 5.2.2 Social Integration construct validity testing

In order to assess construct validity, CFA is conducted on the Social Integration construct, as indicated by the 10 items. CFA using the AMOS, version 20, program is employed on the proposed Social Integration latent construct to assess further the adequacy of the one-component model and of the two-component models. Whereas there is only one solution for a one-component model, there are several possible solutions for a two-component model. The possible solutions can be tested using the AMOS program. The following different types of model structures are assessed in this manner:

- 1) A single factor model (the one-component model solution)
- 2) A two-factor model with uncorrelated or orthogonal factors (a two-component model solution),
- 3) A two-factor model with correlated factors (a second two-component model solution),
- 4) A hierarchical model (a third two-component model solution).

The four model types are designed using AMOS' design facilities. Data are linked to SPSS (.sav) files containing item raw scores. Using AMOS, the four model structures are assessed, with AMOS outputs producing individual item factor loadings and goodness of fit data. Diagrams, of the four types of Social Integration model tested, are presented in Appendix 6. Results of the CFA are summarized in Table 5.4 and Table 5.5.

Table 5.4 records item factor loadings for the four possible models for the Social Integration latent construct. Of the four models presented, the factor loadings for the single factor model are the least adequate.

**Table 5.4 Social Integration Item Factor Loadings**

Survey Item	Single Factor Model	Uncorrelated Two-Factor Model		Correlated Two-Factor Model		Hierarchical Two-Factor Model	
		Factor		Factor		Factor	
		1	2	1	2	1	2
sip1	0.84	0.83		0.83		0.83	
sip2	0.84	0.86		0.85		0.85	
sip3	0.91	0.93		0.93		0.93	
sip4	0.83	0.83		0.84		0.84	
Sip5R	0.45	0.45		0.45		0.45	
sis1	0.41		0.89		0.89		0.89
sis2	0.37		0.92		0.92		0.92
sis3	0.41		0.80		0.81		0.81
sis4	0.39		0.63		0.63		0.63
sis5	0.38		0.60		0.61		0.61
SIP							0.71
SIS							0.52

As recorded in the table, the factor loadings for the five items, which are associated with the SIS subscale, in the single factor solution, are below the value of 0.50. These values are all lower than the five items associated with the SIP subscale. The factor loadings, however, are not as clear in distinguishing between the different two-component models. In order to further assess the adequacy of the four models, the goodness of fit calculations are used.

**Table 5.5 Social Integration Goodness of Fit Indices**

Goodness of Fit Indices	Single Factor Model	Uncorrelated Two-Factor Model	Correlated Two-Factor Model	Hierarchical Two-Factor Model
Chi Square	404.1	106.16	89.84	89.84
df	35	35	34	34
CMIN/df	11.55	3.03	2.64	2.64
TLI	0.32	0.87	0.90	0.90
CFI	0.57	0.92	0.94	0.94
RMSEA	0.28	0.12	0.11	0.11

Table 5.5 records various 'goodness of fit' indicators for the four different models, as generated by the analysis using the AMOS program on the 10 Social Integration survey items. General

values for the different goodness of fit indices have been suggested, where models can be accepted as adequately fitting the data, (Byrne, 2010; Hu & Bentler, 1998). Chi-square is generally reported, but its value is very susceptible to sample size. A better estimate is the 'chi square relative to the degrees of freedom' (CMIN/df), which takes into account sample size. The lower the values for these two indices the better the suggested fit. Values for the Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI) usually range between 0 and 1.0 and indicate good fit at values lower than 0.90, and ideally close to 0.95. The Root Mean Square Error of Approximation (RMSEA) measures the discrepancy between the model and the population taking into account the error of approximation. The optimum values for RMSEA are 0.05 or below, with values greater than 0.10 indicative of poor fit.

The goodness of fit values, presented in Table 5.5, state the factor loading results recorded in Table 5.4. The single factor solution appears the least adequate of the four models tested. The chi square value (404.10) and 'CMIN/df' value (11.55), for the single factor solution, are larger than for the corresponding values for the two-factor models. TLI and CFI values for the single factor solution are 0.32 and 0.57 respectively. These values are well below the 0.90 cut off values for these two indices. The RMSEA value for the single factor solution (0.28) is also well above the 0.10 cut off value for this index.

The two-factor solutions show better fit as recorded by three of the five reported indices, the chi square, CMIN/df, and CFI. However, the RMSEA values are problematic for all two-factor solutions, with all models recording values above the 0.10 cut off value.

In order to assess further the relative validity of the four models, an effort is made to improve the models with the aid of Modification Indices (MI's). These MI's account for the presence of factor-cross loadings and error co-variances (Byrne, 2010, p. 108). MI's can only be computed when there are no missing values in the data set. Thus, the five missing values (out of the 140 respondents) are replaced for each of the 10 items with the item mean score, using the SPSS program on the linked file. The AMOS program is rerun to include MI output. Errors that co-vary are firstly identified, using MI values. An assessment is made whether the identified error co-variances are plausible. This is done by seeing if the corresponding item wording suggests that error covariation is possible. Correlations are then made between item errors that are shown to be plausible and of significant impact.

In order to obtain the modified single factor model, several error correlations are estimated. However, the correlations, suggested by the MI values, are difficult to justify from the wording of the items. For example, items sip1 and sis3 responses correlate according to MI values. However, when reviewing the text for these two items, there appears to be little in common to indicate covariation of the item errors. In order to obtain the modified two-factor models, two error correlations are made, which seem more likely.

For the SIP sub-factor, the errors between two items (sip2 and sip3) are correlated. When assessing the items themselves this correlation seems acceptable. The concept behind both of these items is similar. Specifically these two items are the only two items that begin with the words

“My personal relationships with other students had a positive influence on my...”.

It is thus possible that variations, within these two items and therefore within their errors, are correlated. For the SIS sub-factor, the errors between two items (sis3 and sis4) are correlated. When assessing these items this correlation also seems acceptable. Specifically, these two items deal with the ability to meet academic staff and they positively influence the respondents' career goals and aspirations. These two items are possibly linked, by the expectation that meeting academics after class would more likely influence aspirations as opposed to 'attitudes, values, and interest in ideas' (topics for the other items). These two items are, therefore, closely linked and variance within these items may be correlated.

The resultant four modified SI model types, which include error correlations, are presented in Appendix 5.

AMOS outputs for the modified models include factor loadings and goodness of fit results. The results, for the four modified models tested, are recorded in Table 5.6. Note that the two-factor uncorrelated model is reported twice in this table, firstly as a model incorporating both factors and secondly as two separate factors.

**Table 5.6 Social Integration Factor Loadings of Items with Covariance Modifications**

Survey Item	Single Factor Model	Uncorrelated Two-Factor Model		Correlated Two-Factor Model		Hierarchical Two-Factor Model	
		Factor		Factor		Factor	
		1	2	1	2	1	2
sip1	0.83	0.86		0.86		0.86	
sip2	0.84	0.90		0.89		0.89	
sip3	0.93	0.87		0.87		0.87	
sip4	0.84	0.75		0.76		0.76	
sip5R	0.45	0.49		0.49		0.49	
sis1	0.36		0.89		0.90		0.90
sis2	0.30		0.93		0.92		0.92
sis3	0.33		0.79		0.79		0.79
sis4	0.33		0.60		0.60		0.60
sis5	0.33		0.60		0.60		0.60
SIP							0.65
SIS							0.52

The results, presented in Table 5.6, indicate that the modified single factor solution is the least adequate of the modified models tested. Factor loadings from all 10 items indicate that nine of 10 items can be retained.

The highest factor loading is recorded for sip3 (0.93), and the lowest is recorded for sis2 (0.30), that is the only item recording a factor loading below the 0.33 cut off value. However, as mentioned earlier, several error correlations are made with limited justification (see first diagram in Appendix 5). Goodness of fit statistics produced by the AMOS analyses on the four modified models are summarized in Table 5.7.

**Table 5.7 Goodness of Fit Indices Social Integration with Covariance Modifications**

Goodness of Fit Indices	Single Factor Model	Uncorrelated Two-Factor Model	Correlated Two-Factor Model	Hierarchical Two-Factor Model
Chi Square	132.05	79.12	65.71	65.71
df	29	33	32	32
CMIN/df	4.55	2.39	2.05	2.05
TLI	0.82	0.93	0.95	0.95
CFI	0.89	0.95	0.96	0.96
RMSEA	0.16	0.1	0.09	0.09

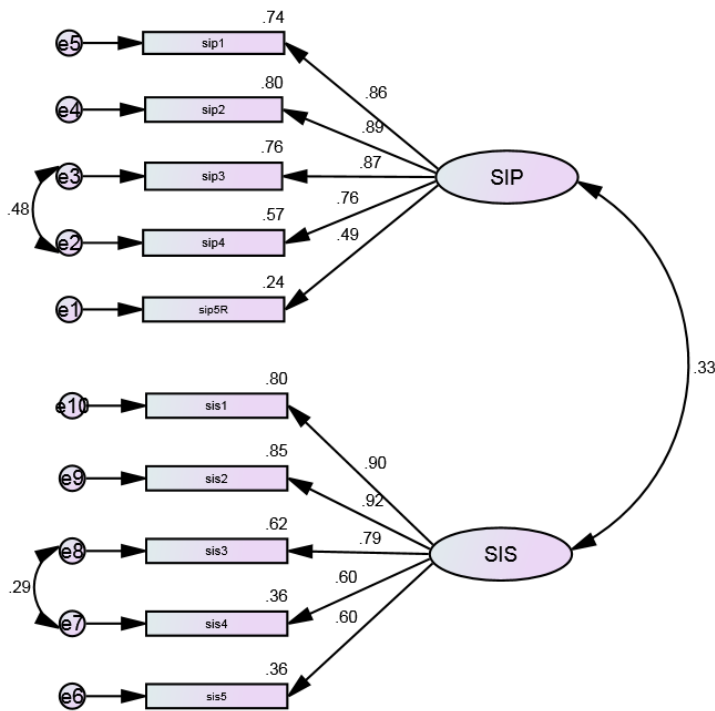
The modified single factor model, (see first diagram in Appendix 7), differs from the original, unmodified single factor model, (see first diagram in Appendix 6). The modified model includes six co-variance connections between the errors. Goodness of fit indices, recorded in Table 5.7, indicate poor fit of the data to the modified single factor model (TLI=0.82, CFI=0.89, RMSEA=0.16).

In comparison to the modified single factor model, the modified uncorrelated, or orthogonal, two-factor model shows better fit to the data. By creating two co-variance connections, one between each one of the two factors, a relatively better fit is obtained as suggested by the goodness of fit indices (TLI=0.93, CFI=0.95, RMSEA=0.10). Factor loadings (presented in Table 5.6) also increase in comparison to the modified single factor model with the lowest factor loading, being 0.49, for the only negatively coded item (sip5R), and all other items registering loadings of 0.60 or higher.

The correlated and hierarchical two-factor models are identical in both factor loadings and in goodness of fit values (TLI=0.95, CFI=0.96, RMSEA=0.09). After two error correlations, one within each of the two factor items, these two models show adequate fit to the data. The fit is better than for the modified single factor model and better than for the modified uncorrelated model. The difference, however, is slight between the modified correlated and modified hierarchical models when compared to the separate factor solution.

This CFA supports the decision to adopt either the correlated two-factor model, or the hierarchical two-factor model. If reduction of the factors to a minimum is required, the hierarchical

model is the most adequate for this. If SIP and SIS are conceived as distinct concepts, having distinct influences on the attrition model, then the two-factor correlated model is more meaningful for this study. The latter proposition is taken in this study, so that SIP and SIS are regarded as separate but correlated concepts. This correlated two-factor model, for SIP and SIS, is represented by Figure 5.1.



**Figure 5.1 Structurally validated SIP and SIS.**  
Validated structure for SIP and SIS as separate but correlated latent structures.

### 5.3 Institutional Commitment and Membership scales

This study uses five items to investigate Institutional Commitment (IM), and a further five items to investigate Institutional Membership (IM). The two concepts are closely related and, at times, they have been considered as a single construct. Thus, this study considers both the single factor and two-factor solutions in terms of structural reliability and validity. Table 5.8 records the 10 items used for these two subscales in the survey instrument for this study (see Appendix 1).



**Table 5.8 Institutional Commitment and Institutional Membership Instrument Subscales**

Subscales	Item Label	Nature of item	Reverse scoring	Item Text
IC	ic1	Positive	None	I was confident that I had made the right decision in choosing to attend this university
	ic2	Positive	None	It was important for me to graduate from this institution as opposed to some other university
	ic3	Positive	None	I was certain this institution was the right place for me
	ic4	Negative	ic4R	It was not important for me to graduate from this university
	ic5	Positive	None	I expected to graduate from this university
IM	im1	Positive	None	I felt like I belonged at this institution
	im2	Positive	None	I felt like I was a member at this university
	im3	Positive	None	I saw myself as part of this university
	im4	Positive	None	I felt emotionally attached to this university
	im5	Positive	None	How did you like the university in your first year?

As for the 10 Social Integration items, the five IC and five IM items have a five-point Likert scale response regime, with only the ‘endpoints’ labelled. For all but one of these 10 items, the two endpoint labels used are ‘strongly disagree’ and ‘strongly agree’. For item im5, the endpoint labels are ‘I didn’t like it at all’ and ‘I liked it very much’, to match the possible range of responses to this item. The 10 IC and IM items can be interpreted as contributing to a single scale of 10 items, referred to as Institutional Commitment and Membership (ICM), or to two subscales, IC and IM, each having five items. One of the 10 ICM items is of a negative nature. This item, ic4, is negatively recoded, ic4R, to match the direction interpreted by the other nine items. Of the 140 respondents, two did not complete this section of the survey.

**Table 5.9 Institutional Commitment and Membership Survey Responses**

Survey ICM Responses	N	%
Responded to all ICM Items (10 items)	138	98.6
Did not respond to all ICM items	2	1.4
Total Survey Respondents	140	100

This is reflected in Table 5.9, which records that 138 (or 98.6%) of the 140 respondents answered all 10 ICM items. Missing data, for these two non-respondents, is not replaced for the first part of the reliability and validity testing. In the second part of the analysis, when error terms are correlated with the aid of MI’s, the missing data, for the two non-respondents, is replaced using the item mean score.

### 5.3.1 Institutional Commitment and Membership reliability testing

In order to assess the reliability and validity of the 10 ICM items used, the survey responses to these items are analysed using the SPSS program. Cronbach's alpha values and Inter Item correlations are calculated. The Cronbach's alpha for the ten items is 0.89, which indicates high overall internal consistency between the items. The results of the Inter Item analysis are presented below.

**Table 5.10 Institutional Commitment and Membership Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
ic1	33.12	53.08	0.54	0.46	0.88
ic2	33.68	50.88	0.54	0.56	0.88
ic3	33.43	50.09	0.73	0.66	0.87
ic4R	33.50	54.43	0.40	0.28	0.89
ic5	32.99	54.26	0.48	0.30	0.89
im1	33.69	48.06	0.79	0.80	0.86
im2	33.83	49.17	0.75	0.81	0.87
im3	33.83	48.02	0.78	0.82	0.86
im4	34.20	48.03	0.69	0.63	0.87
im5	33.39	52.69	0.53	0.44	0.88

The results, recorded in Table 5.10, indicate that all 10 items can be retained. The lowest 'corrected item-total correlation' value is that calculated for the item 'ic4R'. This value is 0.40, which is above the cut-off value of 0.33. Thus, this preliminary assessment indicates that all 10 items can be retained in terms of their reliability in measuring the single ICM construct. The least reliable of the items is the only negatively coded item, 'ic4R'. Following this assessment, an assessment is made of the validity of the 10 items in measuring the ICM construct.

### 5.3.2 Institutional Commitment and Membership construct validity testing

In order to assess validity, CFA is conducted on the ICM construct, as indicated by the 10 items. CFA using the AMOS, version 20, program is employed on the proposed ICM latent construct to further assess the adequacy of a single component and two-component model. Whereas there is only one solution for a single component model, there are several possible two-component models which can be tested using the AMOS program. As was performed for the Social

Integration construct, the following different types of model structures are assessed using the AMOS computer software program:

- 1) A single factor model (the one-component model solution),
- 2) A two-factor model with uncorrelated/orthogonal factors (a two-component model solution),
- 3) A two-factor model with correlated factors (a second two-component model solution),
- 4) A hierarchical model (a third two-component model solution).

The four model types are designed using AMOS' design procedures. Data are linked to SPSS files containing item raw scores. Using AMOS, the four model structures are tested, with AMOS producing item factor loadings and goodness of fit data. Diagrams of the four types of ICM model tested are presented in Appendix 8. Results of the CFA are summarized in Table 5.11 and Table 5.12. Table 5.11 records item factor loadings for the four possible models.

**Table 5.11 Institutional Commitment and Membership Item Factor Loadings**

Survey Item	Single Factor Model	Uncorrelated Two Factor Model		Correlated Two Factor Model		Hierarchical Two Factor Model	
		Factor		Factor		Factor	
		1	2	1	2	1	2
ic1	0.43	0.74		0.72		0.72	
ic2	0.39	0.72		0.68		0.68	
ic3	0.65	0.81		0.87		0.87	
ic4R	0.34	0.48		0.46		0.46	
ic5	0.44	0.52		0.51		0.51	
im1	0.91		0.90		0.91		0.91
im2	0.91		0.93		0.92		0.92
im3	0.92		0.93		0.93		0.93
im4	0.73		0.72		0.73		0.73
im5	0.61		0.61		0.61		0.61
IC							0.92
IM							0.70

Of the four models presented in Table 5.11, the factor loadings for the single factor model are the least appropriate. As recorded in the table, the factor loadings for the four of five items, which are associated with the IC subscale, in the single factor solution, are below the value of 0.50, and these values are all lower than any of the items associated with the IM subscale. The factor loadings, however, are not as clear in distinguishing between the different two-component

models. In order to assess further the adequacy of the four models, the goodness of fit calculations are used. The second table, Table 5.12, presents various 'goodness of fit' indicators for the four different models as generated by the analysis using the AMOS program on the 10 ICM items.

The goodness of fit values, recorded in Table 5.12, reflect the factor loading results recorded in Table 5.11, that is, that the single factor solution appears the least appropriate of the four models tested. The chi square value for the single factor model (202.97) is larger than for the other solutions. This is also the case for the 'CMIN/df' value (5.80), indicating the need to modify the model to better fit the data. TLI and CFI values for the single factor solution are 0.68 and 0.80 respectively. The TLI value is well below the 0.90 cut off value for this index. The RMSEA value for the single factor solution (0.19) is also well above the 0.10 cut off value for this index.

**Table 5.12 Institutional Commitment and Membership Goodness of Fit Indices**

Goodness of Fit Indices	Single Factor Model	Uncorrelated Two-Factor Model	Correlated Two-Factor Model	Hierarchical Two-Factor Model
Chi Square	202.97	154.31	100.53	100.53
df	35	35	34	34
CMIN/df	5.80	4.41	2.96	2.96
TLI	0.68	0.77	0.87	0.87
CFI	0.80	0.86	0.92	0.92
RMSEA	0.19	0.16	0.12	0.12

The two-factor solutions show better fit as indicated by three of the five reported indices, the chi square, CMIN/df, and CFI. However, the RMSEA values are problematic for all two-factor solutions, with all models, apart from one of the two separate factors in the separate factor model, recording values above the 0.10 cut off value.

In order to assess further the relative validity of the four models, MI's are used. First, the two missing values (out of the 140 respondents) are replaced for each of the 10 items with the Item Mean Score. The AMOS program is then rerun to include MI output. Correlations are made between item errors that are shown to be plausible and of significant impact, as indicated by the MI's. The resultant four modified model types, which include error correlations, are presented in Appendix 9.

In order to obtain the modified hierarchical model (see fourth model in Appendix 9) two error correlations are made. For the IC sub-factor, the errors between two items (ic2 and ic4R) are correlated. When assessing the items themselves this correlation seems acceptable. The concept behind both of these items is similar.

One item asked whether “It was important for me to graduate from this...” and the other item asked the negative equivalent of this “It was not important for me to graduate from this...”. It is thus possible that variations within these two items, and their errors, can be correlated. A second correlation is made between item errors across the two sub-components (ic2 and im4). When assessing these items this correlation seems possible. The concept behind both of these items is similar. Specifically these two items deal with the emotional attachment to the institution. If this asked directly “I felt emotionally attached to this university” while the other compares the university with others in the same vein “It was important for me to graduate from this university as opposed to some other university”, thus possibly implying emotional attachment. Both items have the same Likert scale response options. These two items can, therefore, be seen as being closely linked. Variance within these items can be correlated.

The uncorrelated and separate two-factor model for the two separately treated constructs IC and IM share the same error correlations (see second model in Appendix 7). Within the IC factor, the errors between two items (ic2 and ic4R) are correlated. This co-variance is discussed above as part of the hierarchical model. Within the IM factor, the errors between two further items (im3 and im4) are correlated. When assessing the items themselves this correlation seems acceptable. The concept behind both of these items is similar. One item asked whether the student felt “a part of this university” while the other item asked whether the student felt “attached to this university”. It is thus possible that variations with these two items can be correlated. The resultant four modified ICM model types, which include error correlations, are presented in Appendix 7.

AMOS outputs for the modified models include factor loadings and goodness of fit results. The results, for the four modified models tested, are recorded in Table 5.13. Note that the two-factor uncorrelated model is reported twice in this table, first as a model incorporating both factors and second as separate factors.

**Table 5.13 Institutional Commitment and Membership Factor Loadings of Items with Covariance Modifications**

Survey Item	Single Factor Model	Uncorrelated Two-Factor Model		Correlated Two-Factor Model		Hierarchical Two-Factor Model	
		Factor		Factor		Factor	
		1	2	1	2	1	2
ic1	0.43	0.76		0.71		0.71	
ic2	0.39	0.69		0.42		0.42	
ic3	0.65	0.84		0.89		0.89	
ic4R	0.34	0.43		0.42		0.42	
ic5	0.44	0.50		0.50		0.50	
im1	0.91		0.90		0.91		0.91
im2	0.91		0.94		0.92		0.92
im3	0.92		0.91		0.92		0.92
im4	0.73		0.69		0.74		0.74
im5	0.61		0.61		0.62		0.62
IC						0.94	
IM						0.69	

The results, recorded in Table 5.13, indicate that the modified single factor solution is the least adequate of the modified models tested. Factor loadings from all items indicate that all of 10 items can be retained, but some of the items record factor loadings only marginally above the 0.33 cut off value. The highest factor loading is recorded for im3 (0.92), and the lowest is recorded for ic4R (0.34). Goodness of fit statistics produced by the AMOS analyses on the four modified models are summarized in Table 5.14.

**Table 5.14 Goodness of Fit Indices of Four Models of Institutional Commitment and Membership Items with Covariance Modifications**

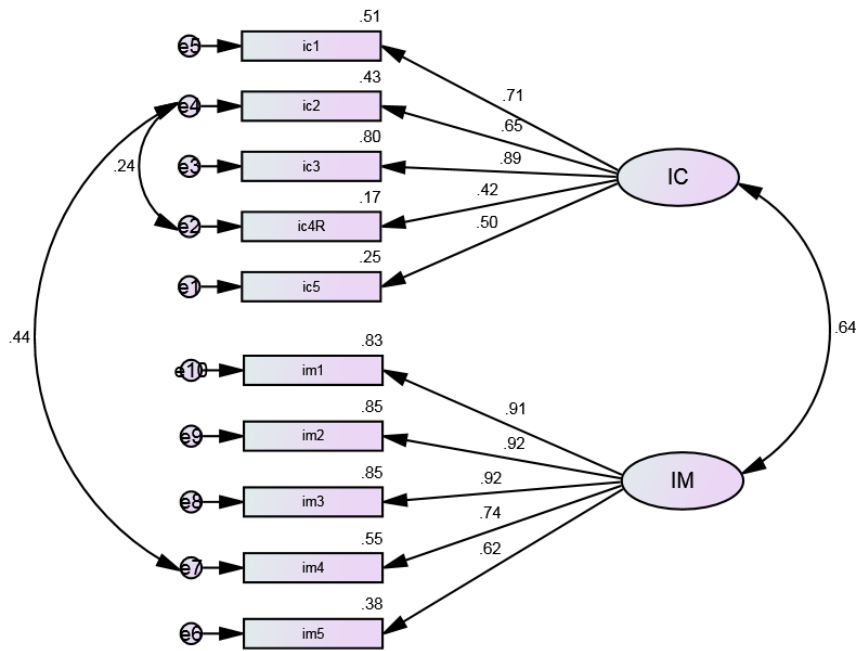
Goodness of Fit Indices	Single Factor Model	Uncorrelated Two-Factor Model	Correlated Two-Factor Model	Hierarchical Two-Factor Model
Chi Square	204.81	142.31	66.68	66.68
df	35	33	32	32
CMIN/df	5.85	4.31	2.08	2.08
TLI	0.68	0.82	0.94	0.94
CFI	0.8	0.87	0.96	0.96
RMSEA	0.19	0.15	0.09	0.09

Results recorded in Table 5.14 indicate that the single factor solution is the least appropriate of the models tested. Goodness of Fit indices indicate a poor fit of the data to the single factor model (TLI=0.68, CFI=0.80, RMSEA=0.19). Better results can only be obtained by creating numerous unlikely co-variance connections between the errors.

The uncorrelated, or orthogonal, two-factor model shows a mixed fit to the data. By creating just two co-variance connections, one between each one of the two factors, better goodness of fit values are obtained. While goodness of fit indices are not quite at the appropriate level (TLI=0.82, CFI=0.87, RMSEA=0.15), they are an improvement over the single factor model. This improved condition is also shown in item factor loadings recorded in Table 5.13. All 10 items have a factor loading above 0.40, with the lowest factor loading, 0.43 for ic4R, the only negatively coded item, and all other items registering loadings of above 0.50.

The correlated and hierarchical two-factor models are identical in both factor loadings and in goodness of fit values (TLI=0.94, CFI=0.96, RMSEA=0.09). After two error correlations, these two models show appropriate fit to the data. The fit is better than for the single factor model and better than for the uncorrelated model.

This CFA supports the decision to use either the correlated two-factor model, or the hierarchical two-factor model. If reduction of the factors to a minimum is required, the hierarchical model is the most appropriate for this. If IC and IM are conceived as distinct concepts, having distinct influences on the attrition model, then the two-factor correlated model is more appropriate. The latter proposition is taken in this study, so that IC and IM are regarded as separate but correlated concepts. This correlated two-factor model, for IC and IM, is represented by Figure 5.2.



**Figure 5.2 Structurally validated IC and IM.**  
Validated IC and IM as separate but correlated latent structures.

## 5.4 Perceived Educational Ability scale

This study uses six items to investigate the Perceived Educational Ability (PEA) construct. In order to assess the reliability and validity of these items a similar process is taken to the Social Integration and ICM construct assessment. First, the reliability of the six items is assessed using Cronbach alpha measurements and then the construct validity is checked using CFA. Table 5.15 records the six items used for the PEA scale in the survey instrument for this study (see also Appendix 1).



**Table 5.15 Perceived Educational Ability Instrument Scale**

Scale	Item Label	Nature of item	Reverse scoring	Item Text
PEA	pa1	Positive	None	In your first year of studies how confident were you that you could get the grades you wanted?
	pa2	Positive	None	How good did you think you were at correctly anticipating what was on the tests beforehand?
	pa3	Positive	None	How effective did you think your study skills were?
	Pa4	Positive	None	When you were waiting for a submitted assignment to be graded, how assured did you feel that the work you had done was acceptable?
	pa5	Negative	None	How much doubt did you have about being able to make the grades you wanted?
	pa6	Positive	None	In your first year of studies how confident were you that you could complete the requirements for your subject with at least a Pass grade?

With respect to the 10 Social Integration items and the five IC and five IM items, the six PEA items have a five-point Likert scale response choice, with only the 'endpoints' labelled. The response labels are worded to match the item meaning. For item pa1 and pa6, as the items ask the respondents 'how confident they were'. The response options range from 'not confident at all' to 'very confident'. For item pa2, as the item asks 'how good'. The response options range from 'not good at all' to 'very good'. For item pa3, the item asks 'how effective' with the response options ranging from 'not effective at all' to 'very effective'. Finally, for item pa5, the item asks 'how much doubt they had' with the response options ranging from 'a lot of doubt' to 'no doubt at all'. While this item is worded negatively, the response options align in the same direction as the other item response options, from a negative to a positive response. Thus, it is not necessary to reverse code the item. Of the 140 respondents, two did not complete this section of the survey.

**Table 5.16 Perceived Educational Ability Survey Responses**

Survey PEA Responses	N	%
Responded to all PEA Items (6 items)	138	98.6
Did not respond to all PEA items	2	1.4
Total Survey Respondents	140	100

This is reflected in Table 5.16, which records that 138 (or 98.6%) of the 140 respondents answered all six PEA items. As was done for the Social Integration construct, missing data, for these two non-respondents, is not replaced for the first part of the reliability and validity examination.

#### 5.4.1 Perceived Educational Ability reliability testing

In order to assess the reliability and validity of the six PEA items used, the survey responses to these items are analysed using the SPSS program. Cronbach alpha values and Inter Item correlations are calculated. The Cronbach alpha for the six items is 0.88, which indicates high overall internal consistency between the items. The results of the Inter Item analysis are recorded in Table 5.17.

**Table 5.17 Perceived Educational Ability Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
pa1	15.56	17.43	0.76	0.60	0.84
pa2	15.54	18.83	0.68	0.48	0.85
pa3	15.30	20.25	0.56	0.33	0.87
pa4	15.34	18.52	0.74	0.56	0.84
pa5	15.71	18.97	0.68	0.49	0.85
pa6	14.84	17.99	0.66	0.47	0.86

The results, presented in Table 5.17, indicate that all six items can be retained. The lowest 'corrected item-total correlation' value is that calculated for the item 'pa3'. This value is 0.56, which is above the cut-off value of 0.33. Thus, this preliminary reliability value indicates that all six items can be retained in terms of their reliability in measuring the PEA construct. Following this estimate, an assessment is made of the validity of the six items associated with this construct.

#### 5.4.2 Perceived Educational Ability construct validity testing

In order to assess validity, CFA is conducted on the PEA construct, as indicated by the six items and AMOS, version 20, software is used to estimate the appropriateness of a one and two-component model for these six items.

Results of the CFA are summarized in the following tables presenting factor loadings (Table 5.18) and the 'goodness of fit' indicators (Table 5.19). These are generated by the analysis using the AMOS program and the six items listed under the Perceived Educational Ability section of the survey.

**Table 5.18 Perceived Educational Ability Item Factor Loadings**

Item	Single Factor Model
pa1	0.82
pa2	0.73
pa3	0.59
pa4	0.80
pa5	0.74
pa6	0.72

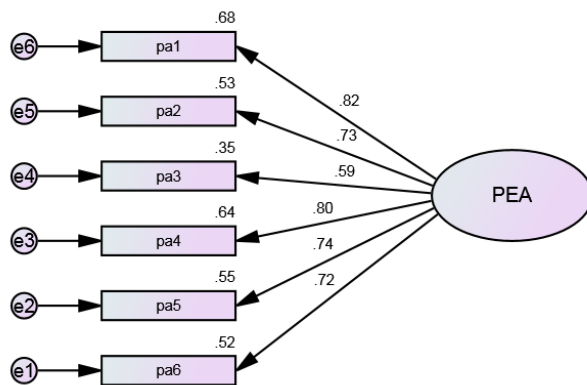
The results, recorded in Table 5.18, indicate that the single factor solution is appropriate. Factor loadings from all items imply that all six items can be retained, as all are above the 0.33 cut off value. The highest factor loading is recorded for pa1 (0.82), and the lowest is recorded for pa3 (0.59). Goodness of fit statistics, produced by the AMOS analyses on the single factor model, are summarized in Table 5.19.

**Table 5.19 Goodness of Fit Indices Perceived Educational Ability**

Goodness of Fit Indices	Single Factor Solution
Chi Square	11.27
df	9.00
CMIN/df	1.25
TLI	0.99
CFI	0.99
RMSEA	0.04

The results recorded in Table 5.19 indicate that the single factor solution is adequate. Goodness of Fit indices imply good fit of the data to the single factor model. The chi square relative to the degrees of freedom value (CMIN/df) of 1.25 indicates that the model fits the data (see Byrne, 2010, p. 76). Values of the TLI and the CFI also support the adequacy of the model. For the single factor solution these values are well above the 0.90 cut off values at 0.99 and 0.99 respectively. The RMSEA also falls below the 0.10 cut off value at 0.04 (Byrne, 2010; Hu & Bentler, 1998).

The CFA thus supports the single factor solution for the Perceived Educational Ability construct. This result is presented in Figure 5.3.



**Figure 5.3 Structurally validated PEA structure**

The next two constructs that are considered for reliability and validity, Perceived Performance and Perceived Effort, are not used in the research model as latent constructs, but are instead used to calculate a manifest measure for 'Academic Efficiency' (AE). Thus, the remaining construct validity assessments are to examine the underlying structure of this AE construct. For these two new constructs more lenient cut-off values for reliability are considered to reflect the preliminary nature of the investigation and to allow future studies to confirm the findings.

## 5.5 Perceived Performance scale

This study uses four items to investigate the Perceived Performance (PP) construct. Two further items are also included in this section of the survey (Appendix 1, items 28 and 29). However, after scrutiny of the item wording, these two extra items are recognized as measuring actual performance rather than perceived performance and are, thus, removed from this analysis as they are not likely to contribute to the PP latent construct. Table 5.20 records the four items used for the PP scale in the survey instrument for this study (see also Appendix 1).

**Table 5.20 Perceived Performance Instrument Scale**

Scale	Item Label	Nature of item	Reverse scoring	Item Text
PP	pp1	Positive	None	What did you think of your grades during your first year at this university?
	pp2	Positive	None	How would you rate your academic performance in the first year university?
	pp3	Positive	None	I achieved acceptable results in my first year at this university
	pp4	Positive	None	My results were good enough in my first year at this university

Items, recorded in Table 5.20, are used to indicate the PP latent construct. All four items have a positive nature and none are reverse coded for the analyses. As for the six PEA items, the PP items have a five-point Likert scale response regime, with only the 'endpoints' labelled (see Appendix 1). The response labels match the item meaning for two of the four items. For item pp1, as the item asks the respondents 'what they thought of their grades' the response options range from 'very low' to 'very high'. For item pp2, the item asks 'how good' with the response options ranging from 'not good at all' to 'excellent'. For items pp3 and pp4, the respondents are asked as to what extent they agree with the item statement. In this case, the two endpoint labels used are 'strongly disagree' and 'strongly agree'. Of the 140 respondents, four did not complete this section of the survey.

**Table 5.21 Perceived Performance Survey Responses**

Survey PP Responses	N	%
Responded to all PP Items (4 items)	136	97.1
Did not respond to all PP items	4	2.9
Total Survey Respondents	140	100

This is reflected in Table 5.21, which records that 136 (or 97.1%) of the 140 respondents answered all four PP items. As is done for the other constructs, missing data, for these four non-respondents, is not replaced for the first part of the reliability and validity examination.

In order to assess the reliability and validity of these items a similar process is taken to the PEA construct assessment. First, the reliability of the four items is assessed using Cronbach alpha measurements and then the construct validity is checked using CFA.

### 5.5.1 Perceived Performance reliability testing

In order to assess the reliability and validity of the four PP items used, the survey responses to these items are analysed using the SPSS program. Cronbach alpha measures and Inter Item correlations are calculated. The Cronbach alpha for the four items is 0.90, which indicates high overall internal consistency between the items. The results of the Inter Item analysis are presented in Table 5.22.

**Table 5.22 Perceived Performance Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
pp1	10.46	9.64	0.72	0.66	0.89
pp2	10.41	8.81	0.81	0.73	0.86
pp3	10.02	8.04	0.80	0.75	0.86
pp4	10.04	8.22	0.80	0.73	0.86

The results of the 'Items Total Statistics' calculations using SPSS, recorded in Table 5.22, indicate that all four items can be retained. The lowest 'corrected item-total correlation' value is that calculated for the item 'pp1'. This value is 0.72, which is above the cut-off value of 0.33. Thus, this preliminary assessment indicates that all four items can be retained, in terms of their reliability in measuring the PP construct. Following this assessment, an examination is made of the validity of the four items in measuring the construct.

### 5.5.2 Perceived Performance construct validity testing

In order to assess validity, CFA is conducted on the PP construct, as indicated by the four items. CFA using the AMOS program is undertaken on the proposed PP latent variable to further assess the adequacy of a one-component model for these four items. Results of the CFA are summarized in the following tables showing the factor loadings (Table 5.23) and the 'goodness of fit' indicators (Table 5.24). These are generated by the analysis using the AMOS program and the four (of six) items listed under the PP section of the survey.

**Table 5.23 Perceived Performance Item Factor Loadings**

Item	Single Factor Model
pp1	0.71
pp2	0.79
pp3	0.91
pp4	0.90

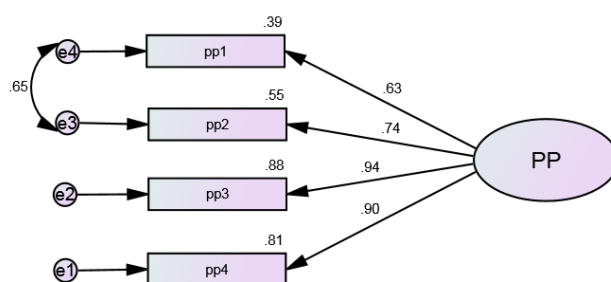
Results of the CFA, recorded in Table 5.23, and showing factor loadings, indicate that the single factor solution is adequate. Factor loadings from all items indicate that all six items can be retained as all are above the 0.33 cut off value. The highest factor loading is recorded for pp3 (0.91), and the lowest is recorded for pp1 (0.71). Goodness of fit statistics, produced by the AMOS analyses on the single factor model, are summarized in Table 5.24.

**Table 5.24 Goodness of Fit Indices Perceived Performance**

Goodness of Fit Indices	Single Factor Solution
Chi Square	67.55
df	2.00
CMIN/df	33.78
TLI	0.18
CFI	0.84
RMSEA	0.49

Results recorded in Table 5.24 indicate that the single factor solution is problematic. Goodness of fit indices indicate inadequate fit of the data to the single factor model. The chi-square value relative to the degrees of freedom (CMIN/df) of 33.78 indicates that the model fit is problematic (see Byrne, 2010, p. 76). Values of the TLI and the CFI also do not support the fitness of the model. For the single factor solution these values are well below the 0.90 cut offs at 0.18 and 0.84 respectively. The RMSEA also falls well above the 0.10 cut off at 0.49.

In order to examine further the relative validity of the PP model, as is done for the Social Integration construct, MI's are used. First, the four missing values (out of the 140 respondents) are replaced for each of the four items with the Item Mean Score. The AMOS program is then rerun to include MI output. Correlations are made between item errors that are shown to be plausible and of significant impact, as indicated by the MI's. The resultant modified PP model, which includes one error correlation, is presented in Figure 5.4.



**Figure 5.4 Structurally validate PP latent structure.**

In order to obtain the modified PP latent model (Figure 5.4), the following error correlation is made. The errors between two items (pp1 and pp2) are correlated. When reading the wording of the items themselves this correlation seems meaningful. The concept behind both of these items

is similar. One item asked “What did you think of your grades...” and the other item similarly asked “How would you rate your academic performance...”. These two items can, therefore, be seen as being closely linked and variance within these items can be meaningfully correlated. The other two items asked respondents whether their performance was good and can, therefore, be seen as being different from these first two PP items. Once the error correlation is made, the AMOS program is rerun. The results are summarized in Table 5.25 and Table 5.26.

**Table 5.25 Perceived Performance Factor Loadings of Items with One Covariance Modification**

Item	Single Factor Model
pp1	0.63
pp2	0.74
pp3	0.94
pp4	0.90

Results for item factor loadings, recorded in Table 5.25, indicate that the modified single factor solution has an adequate fit. Factor loadings from all items indicate that all of four items can be retained. The highest factor loading is recorded for pp3 (0.94), and the lowest is recorded for pp1 (0.63). Goodness of fit statistics produced by the AMOS analyses on the modified model are summarized in Table 5.26.

**Table 5.26 Goodness of Fit Indices Perceived Performance with One Covariance Modification**

Goodness of Fit Indices	Single Factor Solution
Chi Square	2.67
df	1.00
CMIN/df	2.67
TLI	0.98
CFI	1.00
RMSEA	0.11

Goodness of fit indices results, recorded in Table 5.26, indicate that the modified single factor solution is a more adequately fitting model than the unmodified single factor solution. All goodness of fit indices improved for this modified model. Chi square values decreased considerably from 67.55 to 2.67. CMIN/df also decreased from 33.78 to 2.67. TLI values recorded for the modified PP model also improved from 0.18 to 0.98 to within acceptable limits. Similarly, the CFI values also improved from 0.84 to 1.00, thus recording best-fit value for this index. The



RMSEA value also improved from 0.49, to record a value of 0.11, which is only marginally above the cut off limit of acceptable values for this index.

The CFA thus supports the single factor solution with one error correlation for the PP construct. Thus, the PP model used for AE calculations is represented by Figure 5.4. The second construct used for AE calculations is Perceived Effort.

## 5.6 Perceived Effort scale

This study uses five items to assess the Perceived Effort (PE) construct. This PE is postulated for the first time in this investigation as one of two concepts needed to assess the Academic Efficiency measure. Table 5.27 records the five items used for the PE scale in the survey instrument for this study (see Appendix 1).

**Table 5.27 Perceived Effort Instrument Scale**

Scale	Item Label	Nature of item	Reverse scoring	Item Text
PE	pe1	Positive	None	How many contact hours (in lectures, tutorials etc.) a week did you spend at this university during your first semester of enrolment?
	pe2	Positive	None	How many hours a week did you usually spend outside of class (i.e. non-contact hours) in your first year of studies on activities related to your academic program such as studying, writing, reading, rehearsing etc.?
	pe3	Positive	None	The time (contact and non-contact hours) you spent on your studies in your first year at this university was:
	pe4	Positive	None	How much effort did you put into your studies in the first year at this university?
	pe5	Negative	pe5R	It was difficult to find enough time for my studies in the first year at this university

Five items, recorded in Table 5.27, are used to indicate the PE latent construct. As for the other items in the survey, the five PE items have a five-point Likert scale response option. Unlike the other constructs in which only the 'endpoints' of the Likert responses are labelled, four of the five items within this PE section need a third label for the 'midpoint' of the five point Likert scale for clarification purposes. For item pe1 and pe2 which asks for 'number of hours spent studying', the five point responses range from one endpoint 'a lot fewer hours than expected' to the other 'endpoint of 'a lot more hours than expected'. Both of these item responses also have a midpoint labelled as 'as many hours as expected' to clarify the responses available. For items pe3 and pe4, which ask for 'amount of time and effort spent studying' the endpoint labels are 'very little' and 'very much'. The midpoint label for these two items is 'about right'. For the last item in this

section of the survey, pe5, the respondents are asked to what extent they agree with a statement. For this item, only endpoint labels are used. As for previous items using statements rather than question type items, the responses options range from 'strongly disagree' to 'strongly agree'. This last PE item is of a negative nature. This item, pe5, is negatively recoded, pe5R, to match the direction interpreted by the other four items.

**Table 5.28 Perceived Effort Survey Responses**

Survey PP Responses	N	%
Responded to all PE Items (5 items)	136	97.1
Did not respond to all PE items	4	2.9
Total Survey Respondents	140	100

Of the 140 respondents, four did not complete this section of the survey. This is reflected in Table 5.28, which records that 136 (or 97.1%) of the 140 respondents answered all four PE items. As was done for the other constructs, missing data, for these four non-respondents, is not replaced for the first part of the reliability and validity examination.

In order to examine the reliability and validity of these items a similar process is taken to the PP construct examination. First, the reliability of the five items is assessed using Cronbach alpha values and then the construct validity is checked using CFA.

### 5.6.1 Perceived Effort reliability testing

In order to assess the reliability and validity of the five PE items used, the survey responses to these items are analysed using the SPSS program. Cronbach alpha measures and Inter Item correlations are calculated. The Cronbach alpha for the five items is 0.45, which is much lower than the normal 0.80 cut off value for Cronbach alpha (see Ho, 2014, p. 288) and indicates low overall internal consistency between the items with at least one unreliable item. In order to examine which of the PE items are of concern, further analysis is needed. The results of the Inter Item analysis are presented in Table 5.29.

**Table 5.29 Perceived Effort Five Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
pe1	13.91	6.73	0.20	0.08	0.42
pe2	13.69	5.37	0.40	0.25	0.27
pe3	13.69	5.30	0.53	0.39	0.20
pe4	13.19	5.65	0.33	0.31	0.32
pe5R	13.93	7.60	-0.11	0.03	0.66

The results of the 'Items Total Statistics' calculations using SPSS, recorded in Table 5.29, confirm the low Cronbach alpha result and indicate that not all five items are appropriate. The 'corrected item-total correlation' for item pe5R has a negative value (-0.11), unlike any other item in this scale. The analysis indicates that, when this item is removed, the reliability of the remaining four items, as measured by 'Cronbach alpha if item deleted', improves markedly. When viewing the item wording, the notion indicated by the item pe5R (see Table 5.27) is one of 'available time' rather than 'effort' and removing this item thus refines the latent variable to one of effort expended. The analysis is, therefore, repeated after deleting item pe5R.

A second reliability examination using only four of the five items is rerun using the SPSS software program. The Cronbach alpha for the four remaining PE items is 0.66, which indicates better overall internal consistency than in the five item scale, but still slightly lower than the recommended cut off value. The results of the Inter Item analysis for the four-item scale is recorded in Table 5.30 below.

**Table 5.30 Perceived Effort Four Item Total Statistics**

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
pe1	10.74	5.83	0.24	0.08	0.71
pe2	10.51	4.49	0.45	0.25	0.59
pe3	10.51	4.34	0.62	0.39	0.47
pe4	10.01	4.37	0.48	0.29	0.56

The results of the 'Items Total Statistics' calculations using SPSS for the four-item PE scale, recorded in Table 5.30, confirm the reliability assessment of the five-item scale for this same PE construct. The corrected item-total correlation shows all items as having positive values. The lowest value however is 0.24 (for pe1) and slightly below the 0.33 cut off value suggested by Ho

(2014) for retaining the item. When viewing the pe1 item wording, the item appears to be indicating effort expended during 'contact hours' rather than 'contact and non-contact hours' as indicated by item pe3. There is minimal improvement to the Cronbach Alpha value if item pe1 is also removed. If taken to one decimal place a Cronbach Alpha value of 0.7 remains unchanged, and is an acceptable value for preliminary investigations of an untested latent variable (see Peterson 1994). In cases where the item adds meaningful content coverage to untested presumably unidimensional, concepts Schmitt (1996) suggests allowing lower measures of reliability. Thus in this preliminary investigation into the Perceived Effort construct and to maintain the notion which reflects effort expended for university studies which includes effort expended during university contact hours, pe1 is retained.

The preliminary reliability analysis indicates that the four-item scale (Cronbach alpha 0.66) is more reliable than the five-item scale (Cronbach alpha 0.45).

### 5.6.2 Perceived Effort construct validity testing

In order to assess validity, CFA is conducted on the PE construct, as indicated by the five and four item solutions implied by the reliability analysis. CFA is performed using the AMOS, version 20, software program. Results of the CFA are summarized in the following tables showing factor loadings (Table 5.31) and the goodness of fit indicators (Table 5.32) generated by the analysis on the five and four item solutions for the PE latent construct.

**Table 5.31 Perceived Effort Item Factor Loadings**

Survey Item	Single Factor Model	Single Factor Model
	(5 Items)	(4 Items)
pe1	-0.31	0.31
pe2	-0.57	0.56
pe3	-0.83	0.84
pe4	-0.63	0.62
pe5R	0.11	

Results of the CFA, recorded in Table 5.31, confirm the reliability analysis, which points to the negatively recoded item as not contributing to the construct being measured by the other four items. The factor loadings recorded for the five-item model shows that one of the items has a loading completely opposite to the other four items. Thus, the five-item single factor model is not

supported by the CFA. When one item (pe5R) is removed, the resulting four-item model shows better fit. The four items show better factor loadings with only one of the items marginally below the 0.33 cut off (pe1 with a factor loading of 0.31).

Table 5.32 presents the goodness of fit results for the different models of PE. The goodness of fit indices imply that the model indicated by the five items is less adequate. While the TLI and CFI values are of an optimum value, the RMSEA value is 0.20 and above the cut off for this index. It is noted that the CFI is 'normed' with values strictly between 0 and 1.0, the TLI is 'non-normed' and values slightly larger than 1.0 can occur (Hu & Bentler, 1999), thus, explaining the TLI value of 1.01 for the five-item model. For the four-item model the TLI and CFI values remain at optimum values and the RMSEA value drops to 0.00, also the optimum value.

**Table 5.32 Goodness of Fit Indices Perceived Effort**

Goodness of Fit Indices	Single Factor Solution (5 Items)	Single Factor Solution (4 Items)
Chi Square	4.61	1.12
df	5.00	2.00
CMIN/df	0.92	0.56
TLI	1.01	1.05
CFI	1.00	1.00
RMSEA	0.20	0.00

Modification Indices (MI's) are then used to attempt to create a better fitting model. First, the data set are adjusted to replace the missing values for the four respondents that did not answer all the PE items with the Item Mean Score. Once this is done, the AMOS program is run to include the Modification Indices output. Once again, the five-item model shows an opposing factor loading for the negatively recoded item (pe5R). The analysis also indicates that for the four-item model there are no co-variances between the items. The results of the addition of the item means for missing values resulted in no change to the factor loadings (recorded in Table 5.33) but marginally changed the goodness of fit values. The results are presented in the Table 5.33 and Table 5.34.

**Table 5.33 Perceived Effort Factor Loadings Items With No Missing Values**

Survey Item	Single Factor Model	Single Factor Model
	(5 Items)	(4 Items)
pe1	-0.31	0.31
pe2	-0.57	0.56
pe3	-0.83	0.84
pe4	-0.63	0.62
pe5R	0.11	

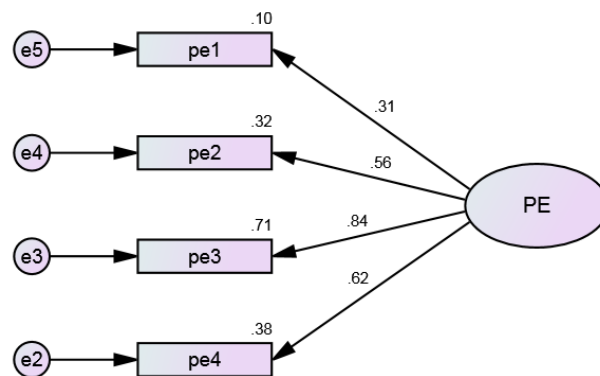
No change is noted in factor loadings, recorded in Table 5.31, following the missing values being replaced by Item mean scores, recorded in Table 5.33. This result can be explained, as no covariances between error terms are made, and essentially the model is unchanged. The four-item solution is shown to be the better model with factor loadings all in the same direction and ranging between 0.31 to 0.84.

Value for goodness of fit indices (recorded in Table 5.34), however, are changed marginally by the missing value replacement. Chi-square and CMIN/df values indicate that the four-item solution is the more appropriate, as these values are lower for the four-item model. Replacing the missing values also allows for the estimation of two further indices; the Goodness-of-Fit Index (GFI) and the Adjusted Goodness-of-Fit Index (AGFI). Both these indices provide relative amounts of variance and covariance and values close to 1.00 indicate good fit, with the adjusted value taking degrees of freedom into account (see Byrne, 2010, p.77). The values for the four-item solution were further supported by these indices for the four-item solution (GFI=1.00, AGFI=0.98) as opposed to the five-item solution (GFI=0.99, AGFI=0.96)

**Table 5.34 Goodness of Fit Indices Perceived Effort With No Missing Values**

Goodness of Fit Indices	Single Factor Solution (5 items)	Single Factor Solution (4 items)
Chi Square	4.75	1.15
df	5	2
CMIN/df	0.95	0.58
TLI	1.01	1.03
CFI	1	1
RMSEA	0	0
GFI	0.99	1.00
AGFI	0.96	0.98

The CFA thus suggests the best model fit for the Perceived Effort scale as being the four-item solution shown in Figure 5.5.



**Figure 5.5 Structurally validated PE latent structure.**

### Summary

The reliability testing and confirmatory factor analyses performed on the latent constructs assessed by the items in the survey are described in this chapter. The five latent construct groups examined are:

- 1) Social Integration tested as a combination of one or two subcomponents, Social Integration with Peers (SIP) and Social Integration with Staff (SIS);
- 2) Institutional Commitment and Membership (ICM) as a combination of one or two subcomponents, Institutional Commitment (IC) and Institutional Membership (IM);

- 3) Perceived Educational Ability (PEA);
- 4) Perceived Performance (PP);
- 5) Perceived Effort (PE).

In the first group, the reliability and confirmatory factor analyses indicate that the Social Integration construct is best represented by two separate latent constructs: Social Integration with Peers and Social Integration with Staff. Similarly, in the second group, the analyses indicate that Institutional Membership and Institutional Commitment can best be represented using two separate latent constructs. The reliability and confirmatory factor analyses performed on the Perceived Educational Ability construct indicate that the latent construct is both reliable and valid when examined using all six items from the survey. The analyses performed on the final two latent constructs Perceived Performance and Perceived Effort indicate that while all four items assessing Perceived Performance can best be retained for reliability and validity purposes, one of the five items used to assess Perceived Effort is best dropped from the analysis to improve this construct's reliability and validity. A second item within the Perceived Effort construct which would change reliability, as measured by Cronbach Alpha, marginally is retained to maintain meaningful content of Perceived Effort expended during university contact time.



## 6 Demographic and Descriptive Statistics

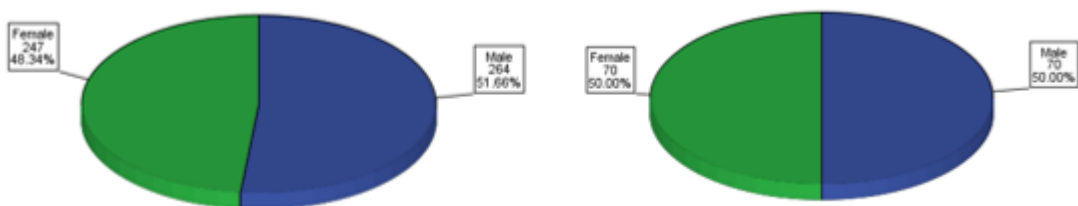
This chapter considers the descriptive statistics of the variables employed in this investigation. In the first section of the chapter, demographic data of the survey respondents, as compared to the VET entrant population, are given. Key variables are selected from the secondary data set which best compare the VET entrant survey respondents with the whole VET entrant population. In the second section of the chapter, descriptive statistics for all the variables used in this study and included in the research model are presented, with the aid of appropriate pie charts, for the dichotomous variables, and histograms, for the continuous variables. It is noted that the histograms present the variables in categorical groups, while the analyses, explained in later chapters treat the variables as continuous. Finally, in the third section of this chapter, the descriptive statistics for all variables used are recorded in a summary table.

### 6.1 Survey sample compared to population data

In this study, 140 VET entrants respond to the survey out of a total population of 511 students. The students had entered the university between 2005 and 2012.

Gender (GEN)

In terms of gender, Figure 6.1 presents the male and female VET entrants in the total 511 student VET entrant population compared to the male and female VET entrants in the 140 student survey sample.



**Figure 6.1 VET entrant population & survey sample gender (male) proportions (GEN).**

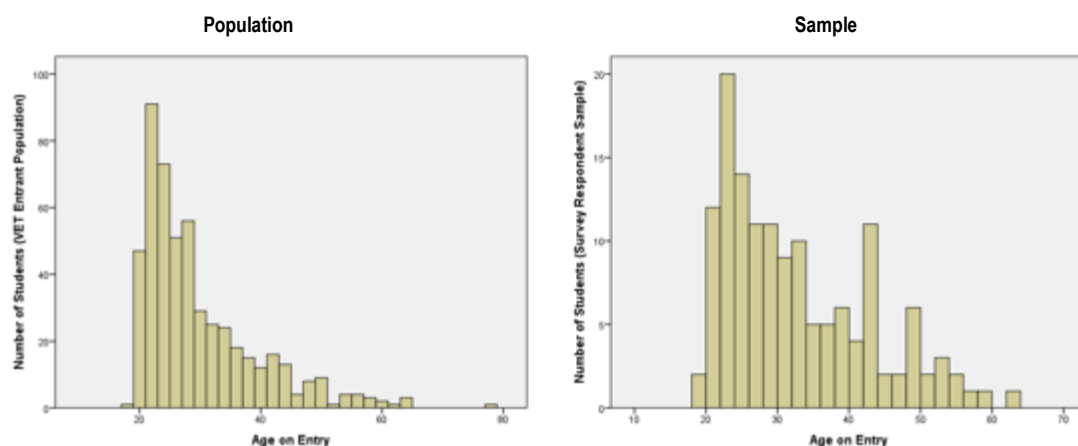
Pie charts showing the gender ratios of the VET entrant population (N=511) on the left and the VET entrant survey sample (N=140) on the right.

Figure 6.1 indicates that the male and female proportions are similar in both the population and the survey sample. However, the survey sample slightly under-represents the number of males

(50% in the survey sample as opposed to 52% in the population) and slightly over-represents the number of females (50% in the survey sample compared to 48% in the population).

### Age (AGE)

In terms of age, Figure 6.2 presents the age range of the VET entrant population compared to the age range of the survey sample.



**Figure 6.2 VET entrant population & survey sample ages (AGE).**

Histograms showing the age range and frequencies of the VET entrant population (N=511) on the left and the VET entrant survey sample (N=140) on the right.

Figure 6.2 indicates that the variabilities in age are similar in both the population and the survey respondent sample. The figure records that, for both the survey respondent sample and the whole VET entrant population, the age of students at entry ranges widely, with the youngest entrants being below 20 years of age and the oldest being over 60. The distribution of both the survey respondents and the population are skewed towards the older end of the histogram. The survey sample is, on average, slightly older with a mean of 32.24 years of age and a standard deviation of 10.21. The population mean for this variable is 29.18 years of age and a standard deviation of 9.48.

### VET Qualification Level (VETQ)

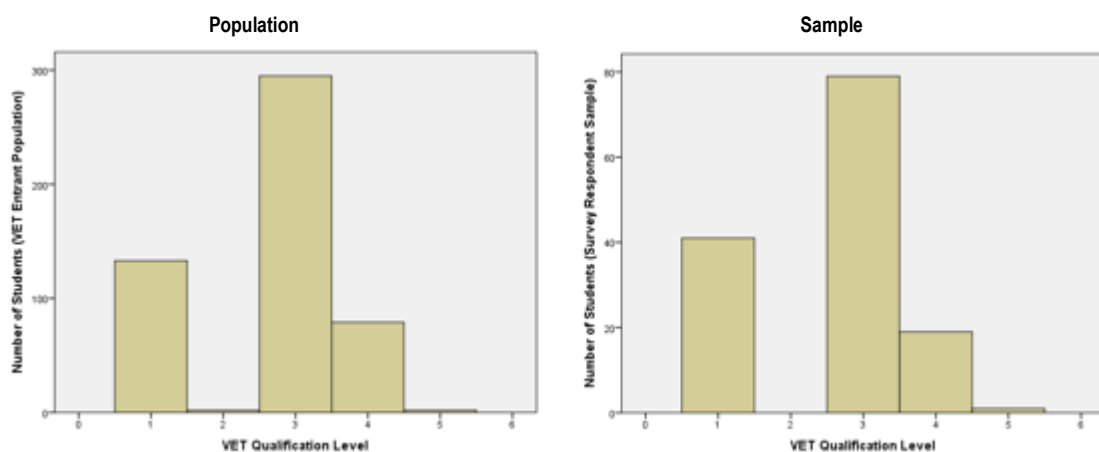
This study focuses on students using a VET qualification for entry purposes. This investigation uses the highest level of VET qualification completed by the students before entering university as recorded in the state admission centre records. During the period, between 2005 and 2012, students were recorded, on state admission centre records, as entering using five VET

qualification levels. Each VET qualification level is assigned a number to reflect the rank order of each of these levels. The levels in ascending order are:

1. Certificate IV
2. Advanced Certificate
3. Diploma
4. Advanced Diploma
5. Graduate Diploma

These are coded one to five. These levels are closely linked to levels in the Australian Qualifications Framework (Australian Qualifications Framework Council, 2011).

Figure 6.3 records the number of students entering using each of these five qualifications for both the VET entrant population and the VET entrant survey respondents.



**Figure 6.3 VET entrant population & survey sample VET qualifications (VETQ).**

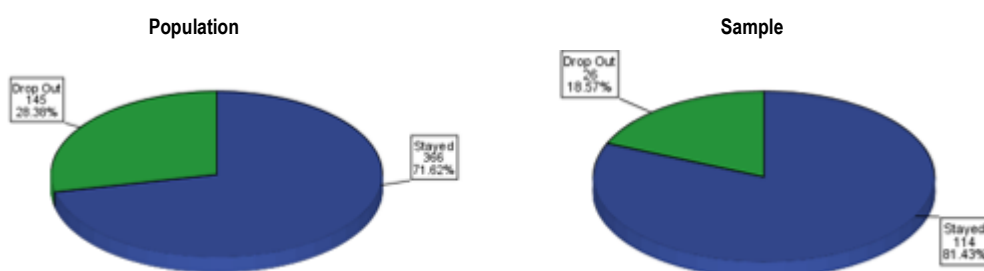
Histograms recording the number of students holding the different level VET qualification levels on entry of the VET entrant population (N=511) on the left and of the VET entrant survey sample (N=140) on the right.

Figure 6.3 presents two histograms, one summarising the VET qualifications of the VET entrant population, and the other summarising the VET qualification levels of the students that responded to the survey, termed as 'the survey sample'. It is evident that the two histograms are alike, indicating that the proportions of students with the different VET qualification levels are similar in both the population and the survey sample. This variable is treated as a continuous variable in the analyses described in later chapters. The mean and standard deviation values for the population (2.64 and 1.04 respectively) and for the survey sample (2.56 and 1.07 respectively)

are similar. In both the population and the survey sample, more students use a Diploma level qualification for entry purposes than any other qualification between 2005 and 2012. Certificate IV is the next most used, and Advanced Diploma is the third most used for entry purposes for both population and survey sample. Only two students entered using an Advanced Certificate level qualification and two with a Graduate Diploma level qualification in the population. One of the two Graduate Diploma entrants responded to the survey and is included in the survey sample. Neither of the two Advance Certificate level entrants responded to the survey, therefore this level is not represented in the survey sample. In general terms, it appears that the survey sample is representative of the population in terms of VET qualification level used for entry.

### Drop Out (DO)

In terms of student attrition, Figure 6.4 shows the student attrition of the population compared to the student attrition of the survey sample.



**Figure 6.4 VET entrant population & survey sample attrition (DO).**

Pie charts recording the number of students dropping out and the number persisting during the first year of studies in the VET entrant population (N=511) on the left and in the VET entrant survey sample (N=140) on the right.

Figure 6.4 indicates that the survey sample under-represents student attrition or the proportion of students who drop out (19% in the survey sample compared to 28% in the population) and over-represents the proportion of students who persist (81% in the survey sample compared to 72% in the population). This finding is consistent with a number of other studies on student attrition and is to be expected. It is understandable that students who drop out are less likely to respond to a survey regarding their experiences while studying. Some studies correct for such biases by giving greater weight to responses from those who drop out. This type of correction assumes that non-respondents had withdrawn for the same reasons as respondents did. This study makes no such assumptions and uses unweighted values in the analyses. The limitation therefore remains that students who have dropped out are under-represented in the survey sample.

## 6.2 Survey respondent demographic data

The variables represented in the research model are separated into three levels:

1. faculty year cohort level variables;
2. program year cohort level variables;
3. student level variables.

This section uses these separations to present descriptive statistics for each of the variables employed in this investigation. During the period of the investigation, between 2005 and 2012, there are eight years of enrolments and therefore eight year enrolment cohorts, for each program and faculty group included in the investigation.

The 140 survey respondents had entered 21 separate single degree programs within all five faculty groups at the university. The five faculties (and 21 programs) involved in the investigation are presented in Table 6.1.

**Table 6.1 List of Programs and Faculties in the Investigation**

Program	Faculty
Bachelor of Developmental Studies	Humanities and Social Sciences
Bachelor of Arts	Humanities and Social Sciences
Bachelor of Environmental Policy & Management	Humanities and Social Sciences
Bachelor of International Studies	Humanities and Social Sciences
Bachelor of of Media	Humanities and Social Sciences
Bachelor of Social Sciences	Humanities and Social Sciences
Bachelor of Agricultural Sciences	Sciences
Bachelor of Agriculture	Sciences
Bachelor of Food & Nutrition Science	Sciences
Bachelor of Science	Sciences
Bachelor of Viticulture & Oenology	Sciences
Bachelor of Wine Marketing	Sciences
Bachelor of Architectural Design	Professions
Bachelor of Commerce	Professions
Bachelor of Economics	Professions
Bachelor of Finance	Professions
Bachelor of Computer Science	Engineering, Computer & Mathematical Sciences
Bachelor of Engineering	Engineering, Computer & Mathematical Sciences
Bachelor of Health Sciences	Health Sciences
Bachelor of Nursing	Health Sciences
Bachelor of Psychological Science	Health Sciences

Table 6.1 presents the programs and faculties that are involved in this investigation. All five faculties are covered in the investigation. It is clear that a wide range of programs are also covered in the study.

### 6.2.1 Faculty level variables

The faculty data are nested in faculty year cohorts. During the period between 2005 and 2012, a total of 40 faculty year cohorts (=8X5) are represented and for which the data are extracted. The faculty level variables in this section are listed in the same order as in Table 3.1 (on page 107).

#### 6.2.1.1 *Faculty Background Characteristics*

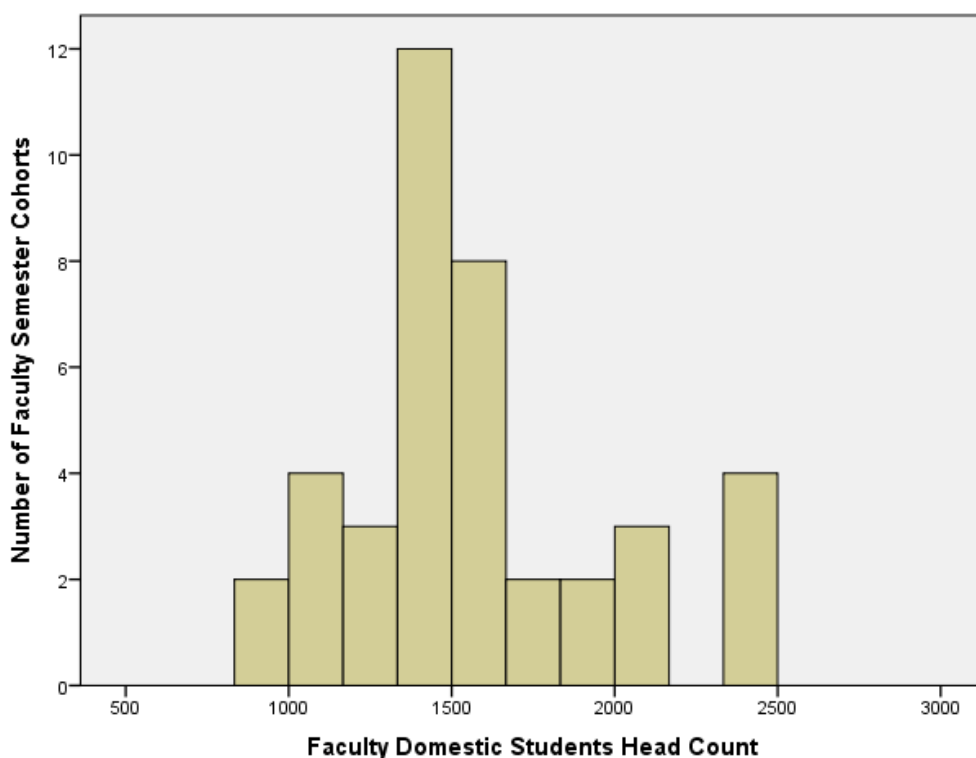
##### Faculty Size

Faculty size is assessed in this study using one variable: Faculty Domestic Student Head Count (F\_DSHC). The values for this variable are expressed as the total number of domestic students enrolling in a particular faculty group in a particular year cohort.

##### Faculty Domestic Student Head Count (F\_DSHC)

Values for this variable are available for the five faculty groups at the university and the related 40 faculty year cohorts. The values are extracted from the university records. Figure 6.5 shows a histogram of these Faculty Domestic Student Head Count values for the 40 faculty year cohorts included in this study.

The histogram, presented in Figure 6.5, records the range of the 40 head count values, for the faculty year cohorts between 2005 and 2012. The mean value is 1570.55 domestic students with a standard deviation of 402.23. The histogram shows that most (22 of the 40) of the faculty year cohorts have between 1300 and 1700 domestic students. The minimum number of domestic students is 937 and the maximum is 2,448.



**Figure 6.5 Faculty group domestic student head counts (F\_DSHC).**

#### Faculty Composition

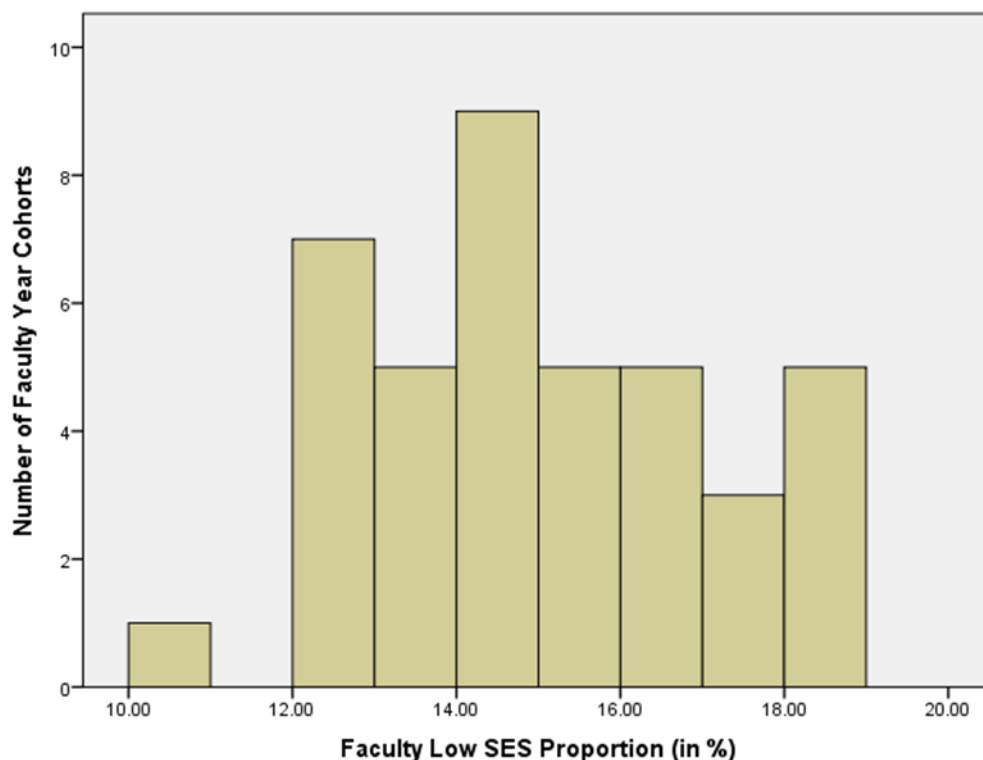
Faculty composition is assessed in this study using two variables: Faculty Low SES Proportion (F\_SES); and Faculty Gender Proportion (F\_GEN). The values for both these variables are expressed as a percentage of the total number of domestic students enrolling in a particular faculty in a particular year cohort.

#### Faculty Low SES Proportion (F\_SES)

Values for this variable are available for the five faculties at the university (see Table 6.1) and the related 40 year cohorts. The values are extracted from the university records and indicate SES assessments made from student home postcode data. Figure 6.6 presents a histogram of the Faculty Low SES values for the 40 faculty cohorts included in this study.

The histogram, presented in Figure 6.6, shows the range of Faculty Low SES values for the faculty year cohorts. The mean faculty year cohort low SES proportion, measured as a percentage, is 15.03 per cent with standard deviation of 2.12. This number is similar to the percentage of low SES students reported in Department of Education data (Australian

Government, 2014b). The histogram records that all of the cohorts had a low SES proportion of 20 per cent or lower. Therefore, none of the cohorts has in excess of 25 per cent low SES proportion, which is the set level for the Australian population.



**Figure 6.6 Faculty group low SES proportions (F\_SES).**

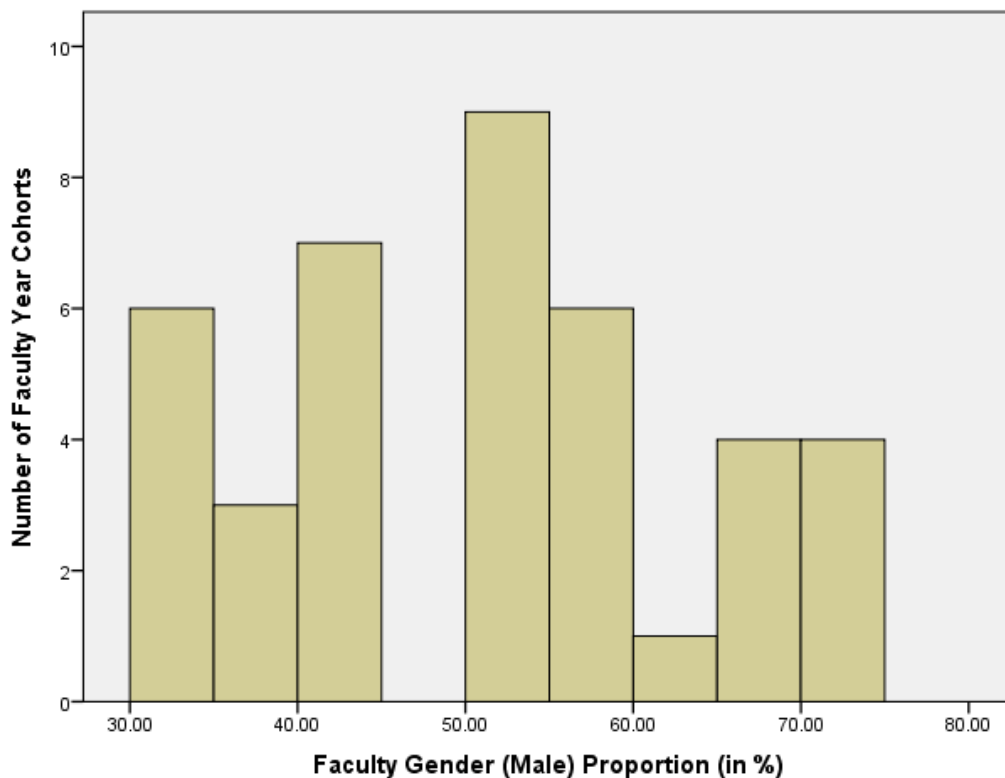
Faculty domestic student low SES proportion, as a percentage of total domestic student head count (F\_SES).

#### Faculty Gender Proportion (F\_GEN)

Values for this variable are available for the five faculty groups at the university and the related 40 faculty year cohorts. The values are extracted from the university records. The numbers recorded refer to the number of domestic male students as a proportion of the total domestic student head count in each faculty year cohort. The values are expressed as a percentage.

Figure 6.7 presents a histogram of the Faculty Gender values for the 40 faculty cohorts included in this study.





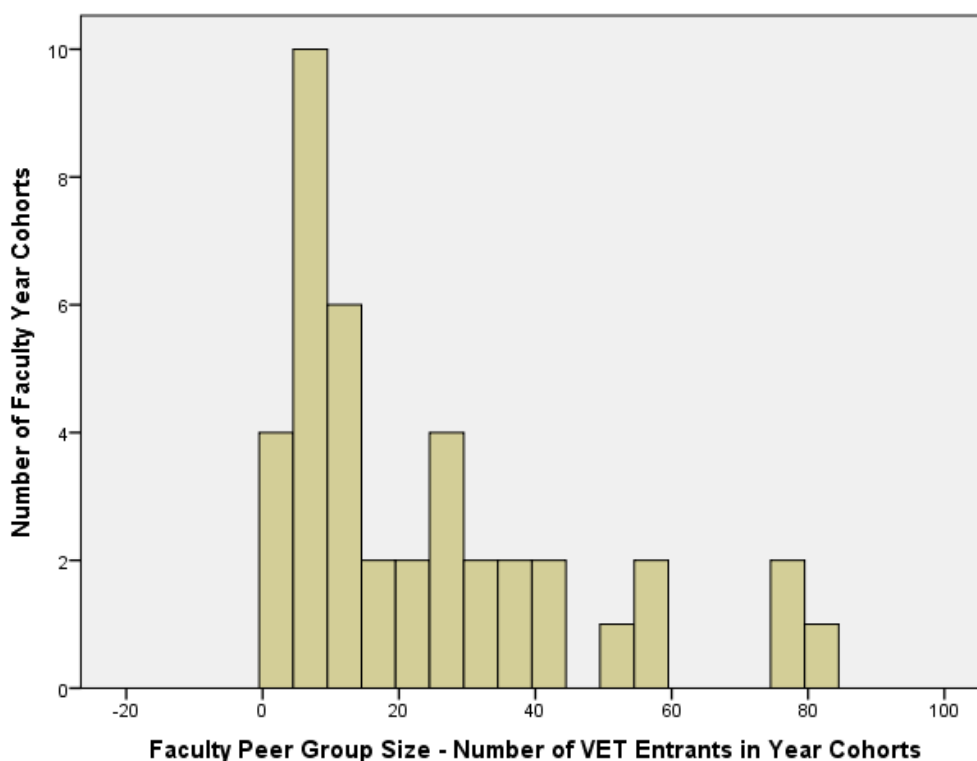
**Figure 6.7 Faculty group gender (male) proportions (F\_GEN).**

Faculty domestic student proportion of males, as a percentage of total domestic student head count.

The histogram, presented in Figure 6.7, shows the range of Faculty Gender values, recorded for the faculty year cohorts. The mean faculty cohort gender (male) proportion, measured as a percentage, is 51.35 per cent with a standard deviation of 12.81. This number indicates that slightly more males were enrolled than females in the 40 faculty cohorts included in this study. Most cohorts, however, have similar numbers of males and females.

#### Faculty Peer Group Size (F\_PGS)

Faculty Peer Group Size is a variable of focus in this investigation. It is assessed as the number of VET entrants in a faculty semester cohort. Values for this variable are available for the five faculty groups at the university and the related 40 year cohorts. The values are extracted from the university records and matched to the VET entrants recorded in the state admission centre records. Figure 6.8 presents a histogram of these values for the 40 cohorts included in this study.



**Figure 6.8 Faculty group peer group sizes (F\_PGS).**

Number of VET entrants in faculty group year cohorts

The histogram, presented in Figure 6.8, shows the range of Faculty Program Group Size values, recorded for the faculty year cohorts. The mean Faculty Peer Group Size is 23.73 VET entrants with a standard deviation of 21.88. The histogram records that all of the faculty cohorts had a VET entrant head count of less than 100 VET entrants. These numbers indicate that the VET entrant student population is quite small when compared to the total domestic student population (F\_DSHC).

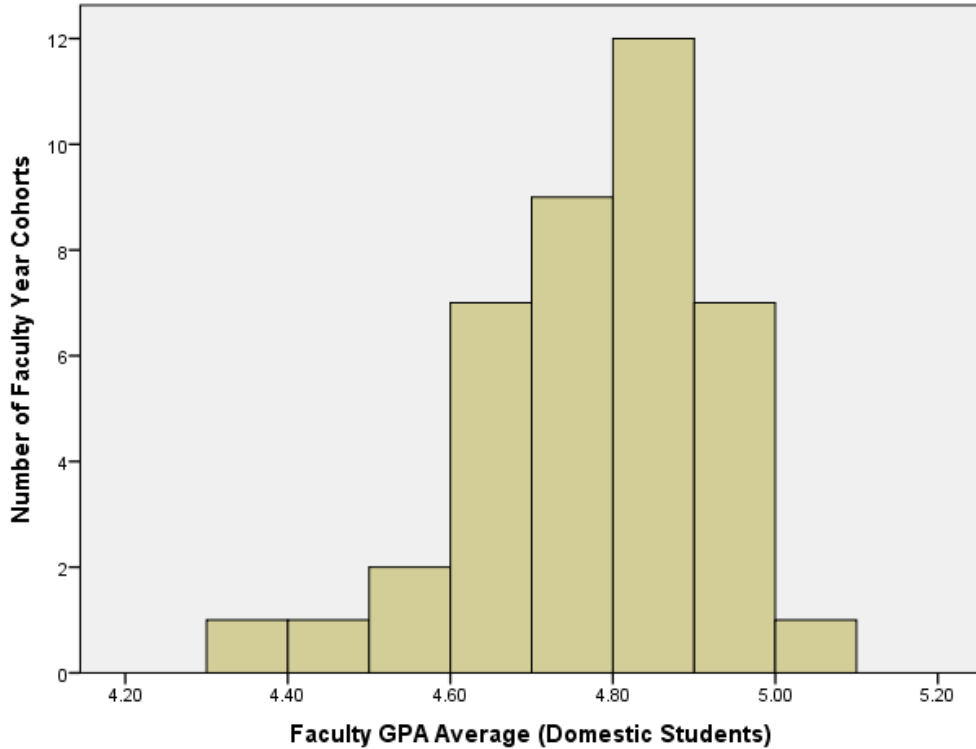
#### 6.2.1.2 Faculty Peer Outcomes

Two 'faculty outcome' variables are investigated in this study: Faculty GPA Average (F\_GPA); and Faculty Retention Rate (F\_ARR).

#### Faculty GPA Average (F\_GPA)

Values for this variable are available for the five faculties at the university and the related 40 faculty year cohort sizes. The values are extracted from the university records and provide the first semester GPA average for all domestic students (see Faculty Domestic Student Head Count

variable on page 166) in each of the 40 faculty year cohorts. The range in Faculty GPA values is shown in Figure 6.9.

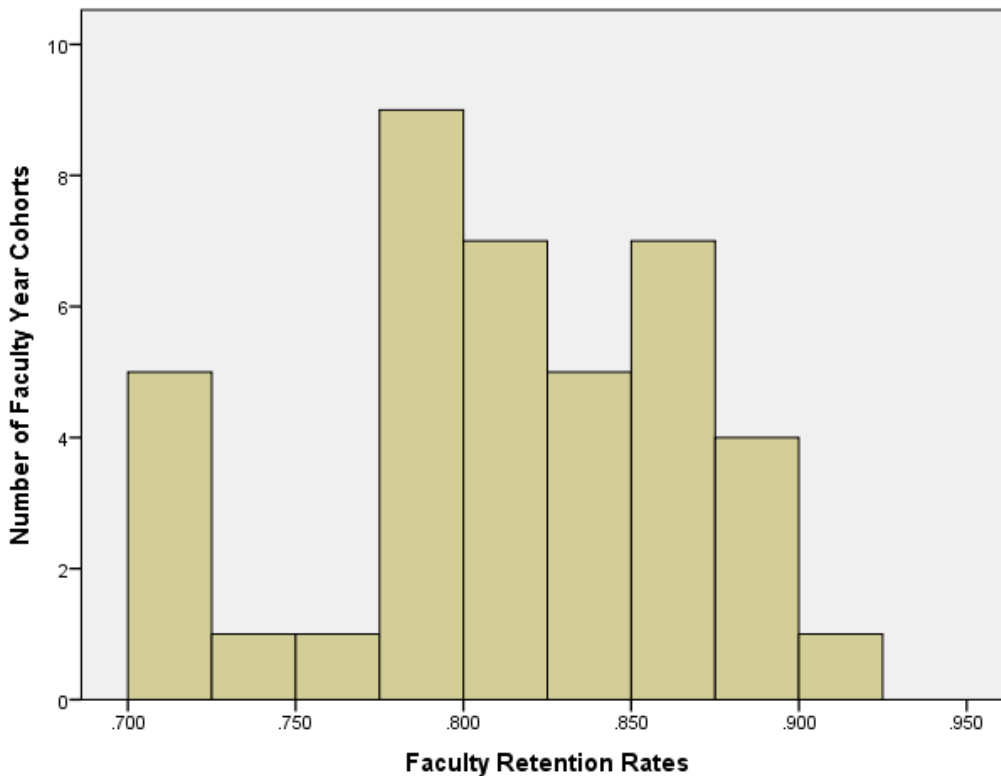


**Figure 6.9 Faculty group GPA averages (F\_GPA).**

The histogram, shown in Figure 6.9, records the range of Faculty GPA Averages for the 40 faculty year cohorts in this study. The mean Faculty GPA Average value is 4.78 with a standard deviation value of 0.15. This mean value indicates a value higher than one for an overall pass. All of the cohorts have a Faculty GPA Average above the overall pass value of 4.00.

#### Faculty Retention Rate (F\_ARR)

Faculty retention rates are calculated from faculty enrolment data, collected from university records, using the formula for apparent retention rates given in Section 4.12. The values for this variable are calculated for the five faculty groups at the university and the related 40 faculty year cohorts. The range in Faculty Retention Rate values is shown in Figure 6.10.



**Figure 6.10 Faculty group retention rates (F\_ARR).**

The histogram, presented in Figure 6.10, shows the range of Faculty Retention Rates for the 40 faculty year cohorts in this study. The mean value is 0.81 with a standard deviation value of 0.05. This mean retention rate estimates that, on average, 81 per cent of domestic students within a faculty year cohort persist to the second year of studies. Conversely, the average faculty drop-out rate is 19 per cent.

## 6.2.2 Program level variables

The 140 survey respondents had entered 21 separate single degree programs. The programs included in this investigation are presented in Table 6.1 on page 165. The program data refers to these 21 separate single degree programs during the period between 2005 and 2012. If at least one survey respondent enters all year cohorts available between 2005 and 2012, a total of 168 program year cohorts (=21X8) is represented. However, not all of these cohorts have at least one VET entrant who responds to the survey. In total, there are 54 year cohorts (for the 21 different programs, which contain a survey respondent) for which the data are extracted. The program level variables in this section are listed in the same order as in Table 3.1 on page 107.

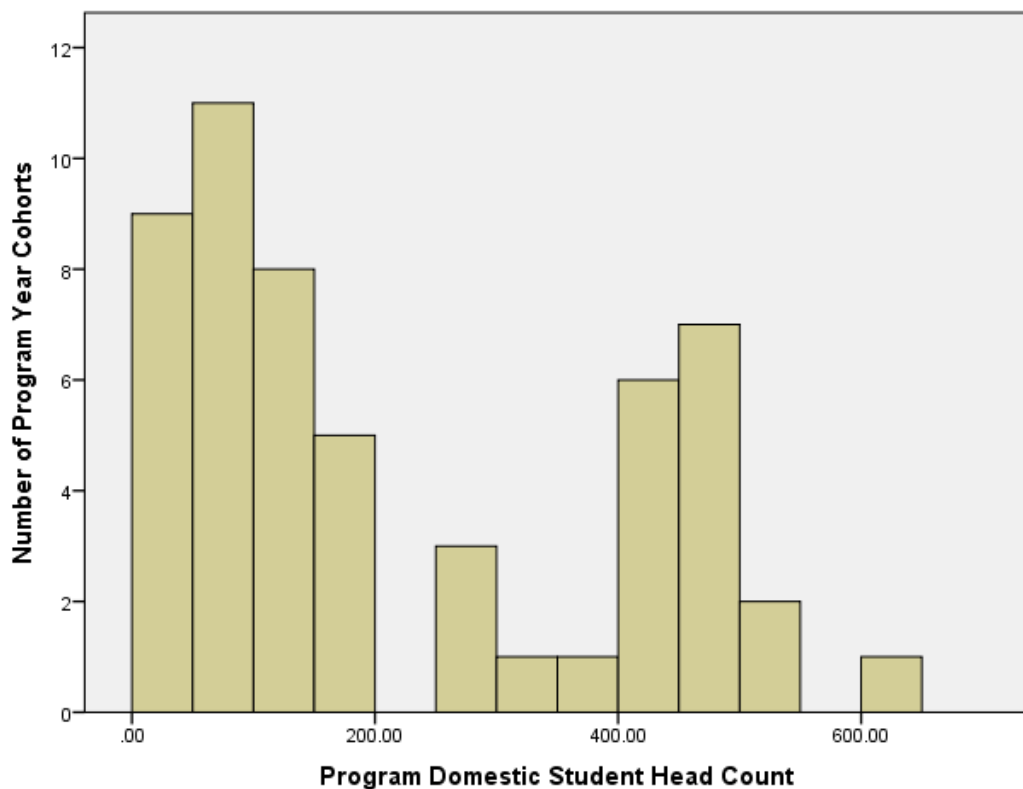
### 6.2.2.1 Program Background Characteristics

#### Program Size

Program size is assessed in this study using one variable: Program Domestic Student Head Count (P\_DSHC). The values for this variable are expressed as the total number of domestic students enrolling in a particular program in a particular year cohort.

#### Program Domestic Student Head Count (P\_DSHC)

Values for this variable are available for the 21 programs at the university and the related 54 year cohort sizes. The values are extracted from the university records. Figure 6.11 shows a histogram of the P\_DSHC values for the 54 program year cohorts included in this study.



**Figure 6.11 Program group domestic student head counts (P\_DSHC).**

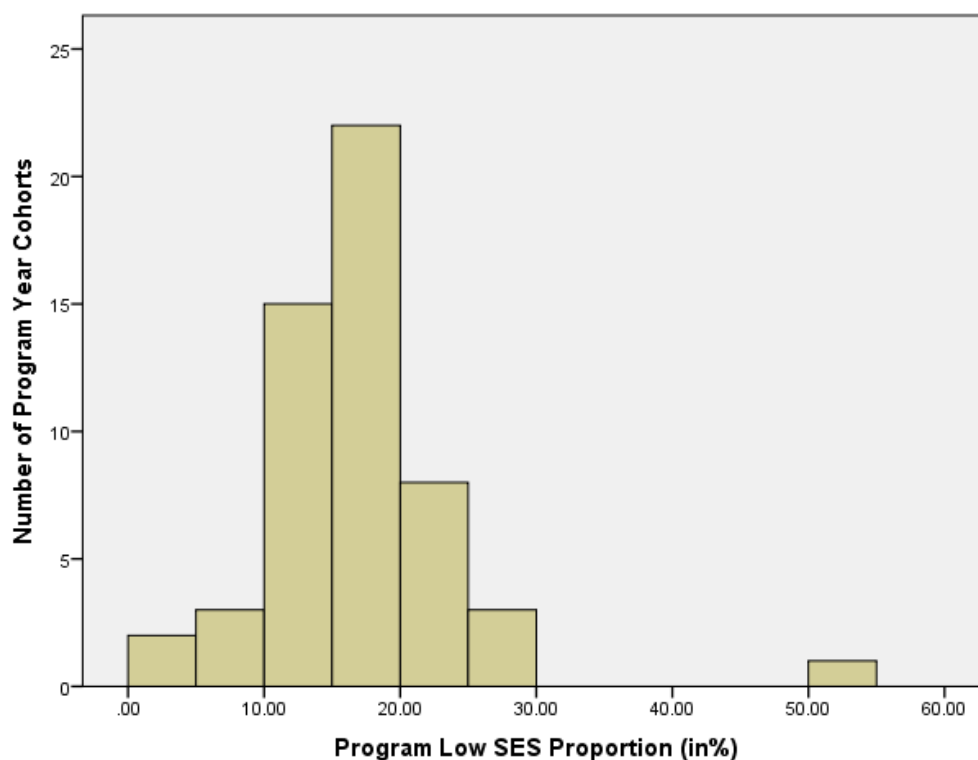
The histogram, presented in Figure 6.11, shows the range of Program Domestic Student Head Count values, recorded for the program year cohorts that contain at least one VET entrant survey respondent. The mean cohort size is 223.04 domestic students. The mean has a standard deviation of 183.64. The histogram shows that many (33 of the 54 or 61.1%) of the cohorts have a domestic student head count of fewer than 200 students. The largest cohort size is 643 domestic students.

## Program Composition

Program composition is assessed in this study using two variables: Program Low SES Proportion (P\_SES); and Program Gender Proportion (P\_GEN). The values for both these variable are expressed as a percentage of the total number of domestic students enrolling in a particular program in a particular year cohort.

### Program Low SES Proportion (P\_SES)

Values for this variable are available for the 21 programs at the university and the related 54 program year cohorts. The values are extracted from the university records and indicate SES assessments made from student home postcode data. Figure 6.12 shows a histogram of the Program Low SES values for the 54 cohorts included in the study.



**Figure 6.12 Program group low SES proportions (P\_SES).**

Program domestic student low SES proportion, as a percentage of total domestic student head count.

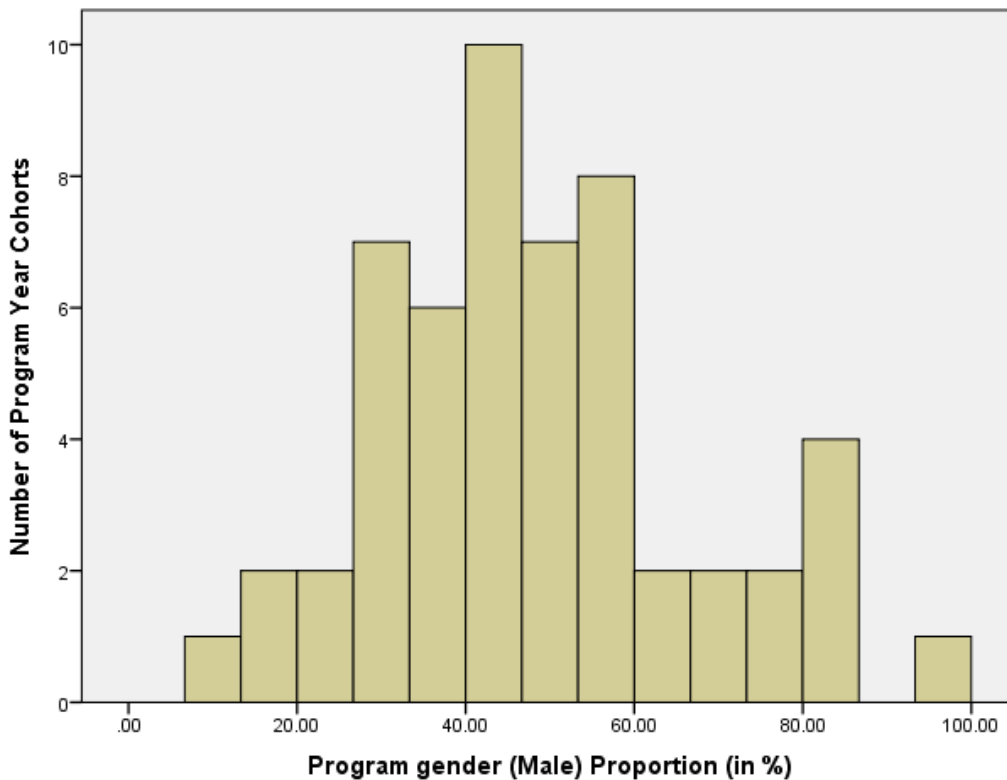
The histogram, presented in Figure 6.12, shows the range of Program Low SES values, recorded for the program year cohorts that contained at least one VET entrant survey respondent. The

mean cohort low SES proportion, measured as a percentage, is 16.61 per cent. This number indicates the percentage of low SES students present at the university level that is reported in Department of Education data (Australian Government, 2014b). The mean has a standard deviation of 6.83. The histogram records that most (42 of the 54 or 77.8%) of the cohorts have a 'low SES' proportion of 20 per cent or lower. Only four (of the 54 or 7.4%) of the cohorts have a higher than 25 per cent low SES proportion.

#### Program Gender Proportion (P\_GEN)

Values for this variable are available for the 21 programs at the university and the related 54 program year cohorts. The values are extracted from the university records and indicate the number of domestic male students as a proportion of the total domestic student head count. The values are expressed as a percentage. Figure 6.13 shows a histogram of the Program Gender values for the 54 program cohorts included in the study.

The histogram, presented in Figure 6.13, shows the range of Program Gender values, recorded for the program year cohorts that contained at least one VET entrant survey respondent. The mean cohort gender (male) proportion, measured as a percentage, is 48.08 per cent. The mean has a standard deviation of 18.78. The mean number indicates that slightly more females were enrolled than males in the 54 cohorts included in this study. The histogram records that one of the (smaller) cohorts has all males. Conversely the other end of the histogram shows that one small cohort has only 10 per cent males and thus mostly females. Most cohorts, however, have similar numbers of males and females



**Figure 6.13 Program group gender (male) proportions (P\_GEN).**

Program domestic student proportion of males, as a percentage of total domestic student head count.

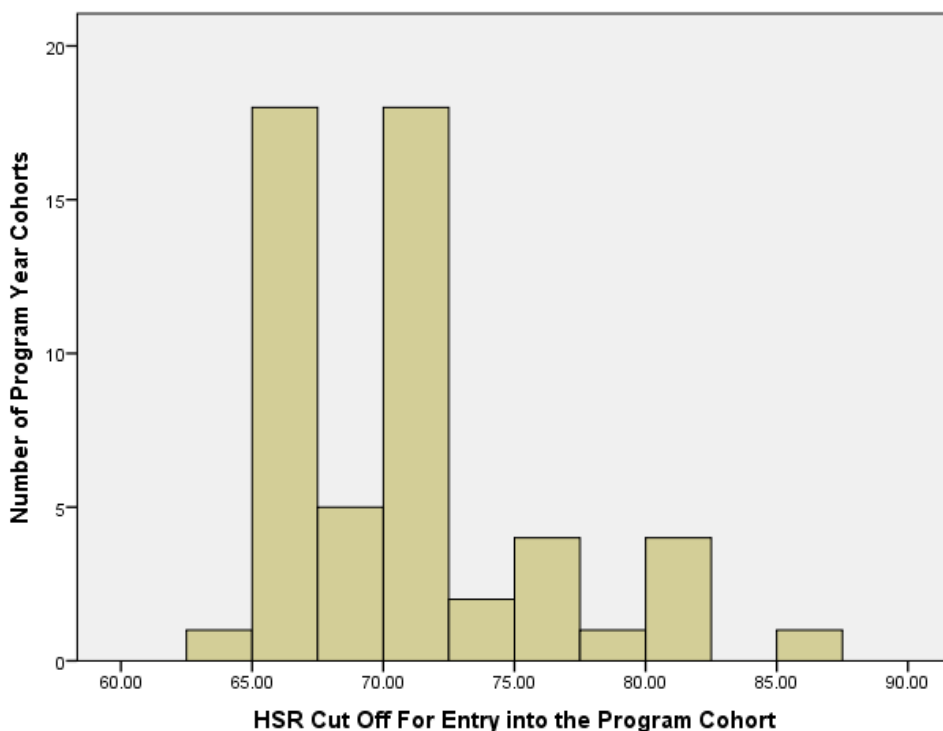
### Program Selectivity

Program selectivity is assessed in this study using one variable: Program High School Rank Cut Off (P\_HSRCO). The values for this variable are expressed as the high school percentile rank scores required for entry into the program year cohorts in this study.

### Program High School Rank Cut Off (P\_HSRCO)

Values for this variable are available for the 21 programs and the related 54 program year cohorts. The values are extracted from the university records. Figure 6.14 shows a histogram of the Program High School Rank Cut Off values for cohorts included in this study.



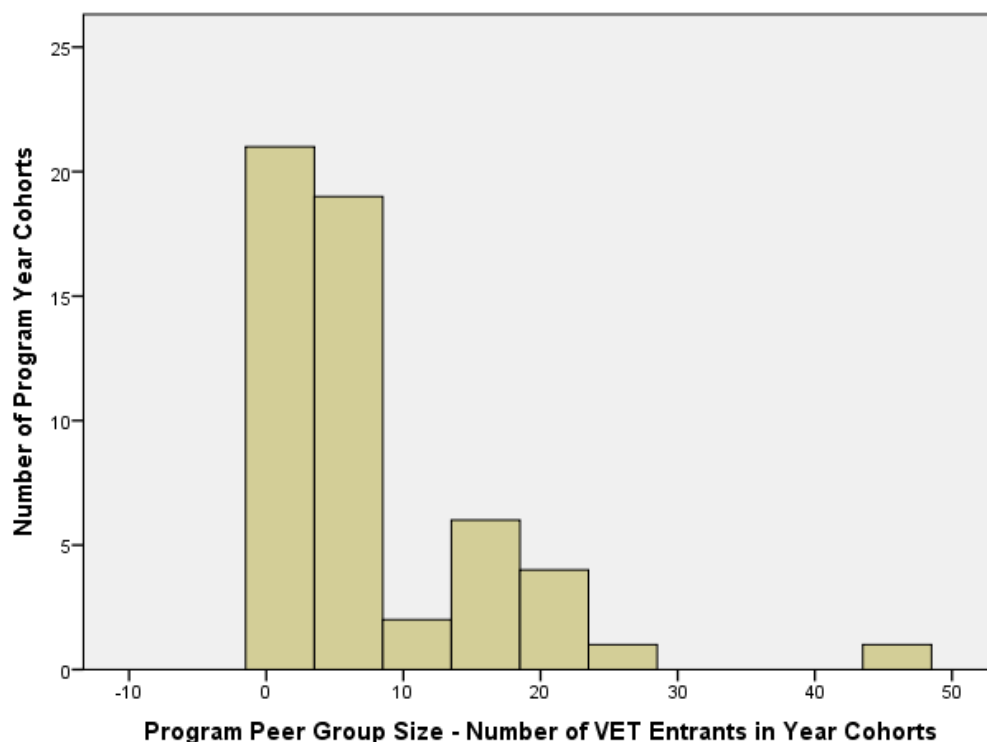


**Figure 6.14 Program group high school rank cut off scores (P\_HSRCO).**  
High school rank scores required to enter the different program groups.

The histogram, presented in Figure 6.14, shows the range of Program High School Rank Cut Off values, recorded for the program year cohorts that contained at least one VET entrant survey respondent. The mean value for the 54 cohorts is 70.20. The mean has a standard deviation of 5.01. The histogram indicates that no cut off score is below 60 and that most (44 of the 54 or 81.5%) of the cohorts recorded a cut off value of between 60 and 75. The highest recorded Program High School Rank Cut Off value is 87.15.

#### Program Peer Group Size (PGS)

Program Peer Group Size is a variable of focus in this investigation. It is assessed as the number of VET entrants in a program year cohort. Values for this variable are available for the 21 programs at the university and the related 54 program year cohorts. The values are extracted from the university records and matched to the VET entrants recorded in the state admission centre records. Figure 6.15 shows a histogram of the Program Peer Group Size values for the cohorts included in this study.



**Figure 6.15 Program group peer group sizes (PGS).**

Number of VET entrants in program group year cohorts

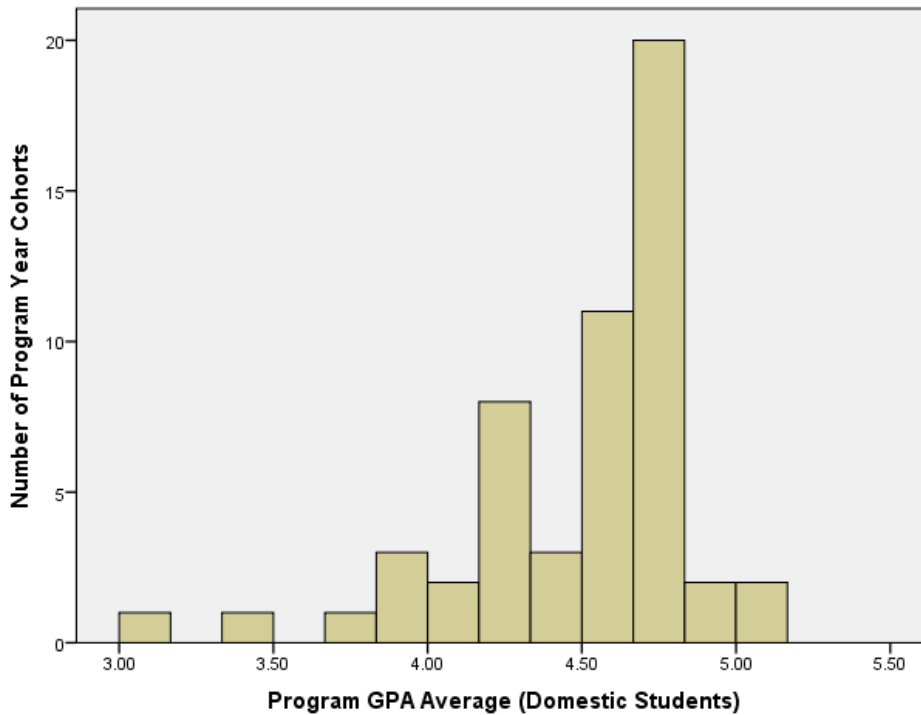
The histogram presented in Figure 6.15, shows the range of Program Peer Group Size values, recorded for the program year cohorts that contained at least one VET entrant survey respondent. The mean Peer Group Size is 7.67 VET entrants with a standard deviation of 8.36. The histogram records that most (41 of the 54 or 75.9%) of the cohorts have a VET entrant head count of fewer than 10 students. Only three (of the 54 or 5.6%) of the cohorts have in excess of 20 VET entrants. A large number (11 of the 54 or 20,4%) of the cohorts have only one or two VET entrants.

#### 6.2.2.2 Program Peer Outcomes

Two 'program peer outcome' variables are investigated in this study: Program GPA Average (P\_GPA); and Program Retention Rate (P\_ARR).

##### Program GPA Average (P\_GPA)

Values for this variable are available for the 21 programs at the university and the related 54 year cohorts. The values are extracted from the university records and indicate the first semester GPA average for all domestic students in each of the 54 program year cohorts. The range in Program GPA Average values is shown in Figure 6.16.

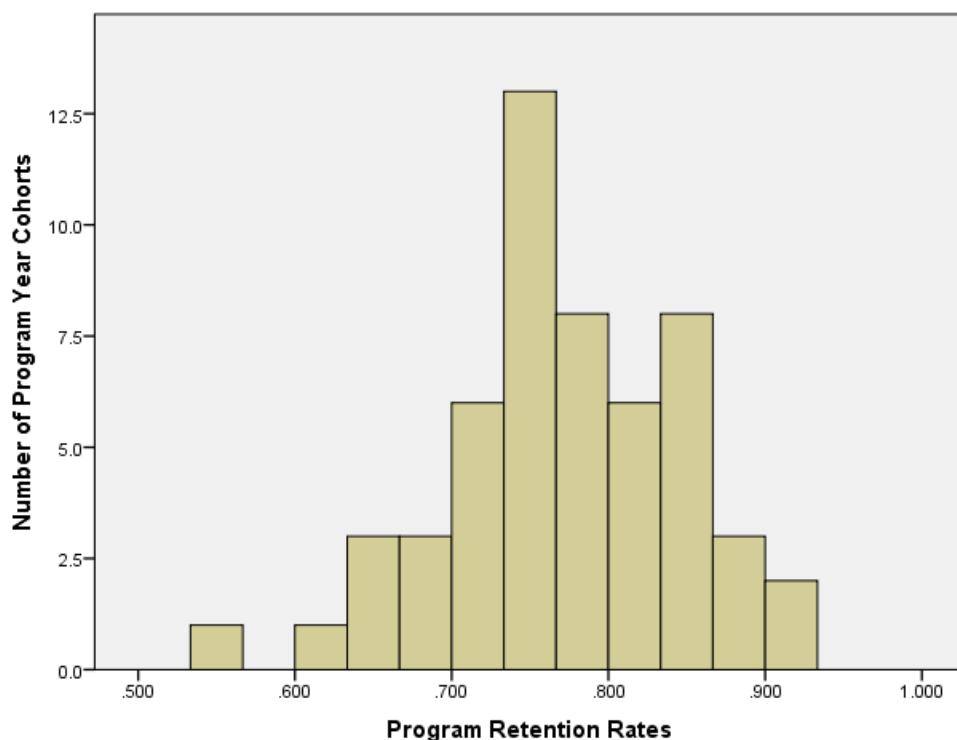


**Figure 6.16 Program group GPA averages (P\_GPA).**

The histogram, presented in Figure 6.16, shows the range of Program GPA Averages for the 54 year cohorts in this study. The mean Program GPA Average value is 4.50 with a standard deviation value of 0.38. This mean GPA average value indicates a higher than pass average. Most (48 of the 54 or 88.9%) of the cohorts have a program GPA average above the overall pass 4.00 value.

#### Program Retention Rate (P\_ARR)

Program retention rates are calculated from program enrolment data, collected from university records, using the formula for apparent retention rates given in Section 4.1.2. The values for this variable are calculated for the 21 programs at the university and the related 54 program year cohorts. The range in Program Retention Rate values is shown in Figure 6.17.



**Figure 6.17 Program group retention rates (P\_ARR).**

The histogram, presented in Figure 6.17, shows the range of Program Retention Rates for the 54 year cohorts in this study. The mean Program Retention Rate value is 0.77 with a standard deviation value of 0.08. This retention rate mean indicates that, on average, 77 per cent of domestic students within a program year cohort persist to the second year of studies. Conversely, the average program drop out rate is 23 per cent in this study.

### 6.2.3 Student Level Variables

The student level variables in this section are listed in the same order as in Table 3.1, on page 107.

#### 6.2.3.1 Student Background Characteristics

##### Academic Background

Academic background is addressed by a number of factors in this investigation, including academic ability, qualification level and study gap.

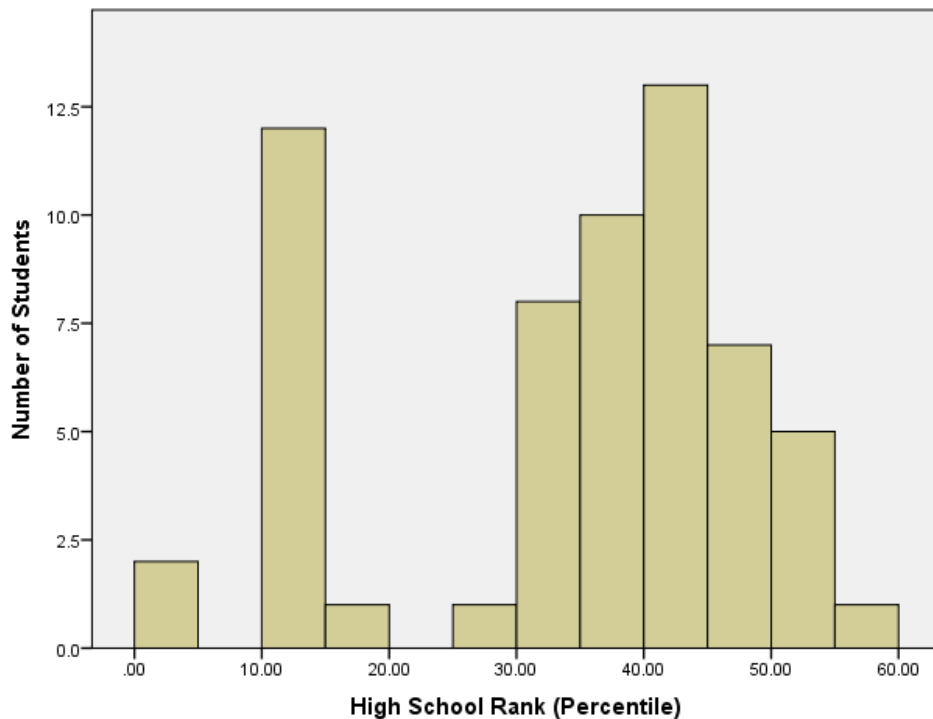
### Student Academic Ability

This concept is of particular interest to many studies on student success and persistence at university. Universities generally base university entry on some measure of achievement at a previous, usually secondary, educational institution. As is shown, this group of students tends not to have any such measure. The statistics for the next two variables are thus restricted to this descriptive section of the quantitative analyses. Nevertheless, the descriptive statistics for the variables assessed in this section give an insight into this group of students and in some way explain why these students have taken an 'alternative (VET) pathway' to university. In a way this investigation becomes even more unique in that deals with a group of students who lack reliable measures for their 'Student Academic Ability'. It may well be that this is a feature shared by many students that have come from a disadvantaged background.

Thus, Student Academic Ability is assessed in this study using two variables: Student High School Rank (HSR); and Special Tertiary Admissions Test Rank (STATR). The values for both these variables are expressed as percentile ranks. Percentile ranks provide information about how well a student performed relative to the relevant population in the corresponding year. For example, a percentile rank of 60.00 recorded for the 'STAT' test indicates that the student achieved a score that is as good as or better than 60.00 per cent of the test taking population in the year that the test was taken. Similarly a High School Rank value of 60.00 indicates that the student achieved high school leaving grades that are as good as or better than 60.00 per cent of the high school leaver population of that year.

### Student High School Rank (HSR)

Values for this variable are available for 60 of the 140 survey respondents. The values are extracted from the state admission centre records. Figure 6.18 shows a histogram of the High School Rank values for the 60 students whose values are recorded.



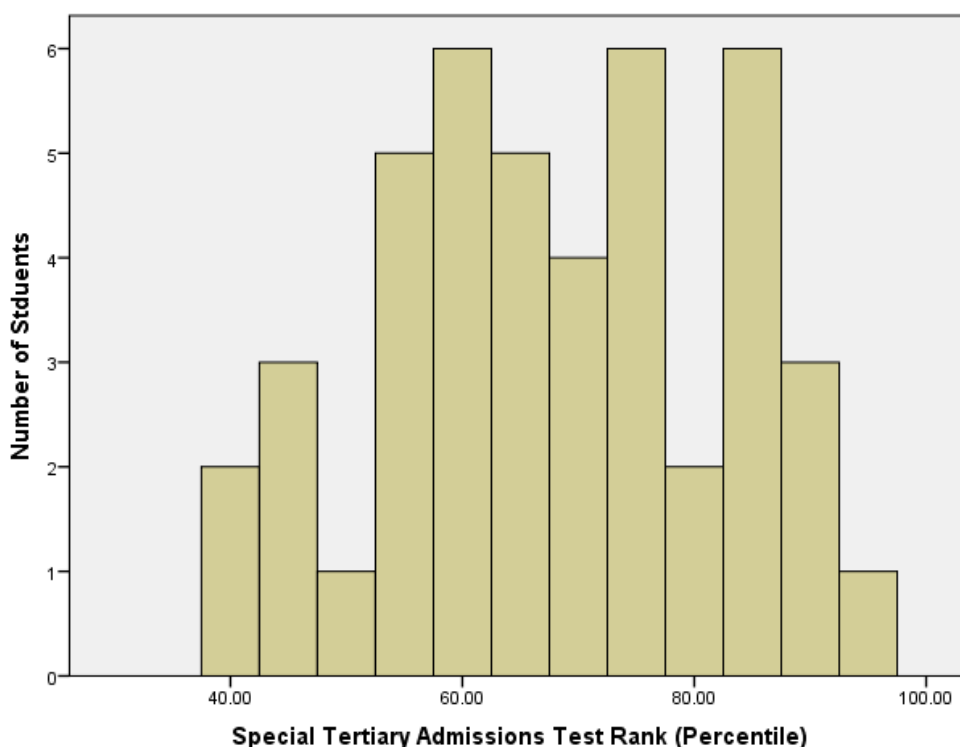
**Figure 6.18 VET entrant students high school rank scores (HSR).**  
High school rank scores achieved by the individual VET entrant students in the survey sample.

The histogram, presented in Figure 6.18, shows the range of Student High School Rank values, in percentile rank, recorded for the VET entrant survey sample. Only 60 of the 140 students have a recorded value according to state admission centre records. This indicates that more than half the students in the survey sample did not receive a final high school rank. Possibly, some may not have completed their high school studies. For the 60 students that did finish and received a High School Rank value, their percentile ranks are relatively low. All the recorded values are below 60, with a mean value of 33.74 and a standard deviation of 14.39. In general, High School Rank values range between 0 and 99.95. Entrance for high school entrants at the university is restricted to High School Rank values of above 60.00 (see Program High School Rank Cut Off values in the program variables section). It is important to recognize that none of the VET entrants could have entered the university using their recorded High School Rank values.

#### Special Tertiary Admissions Test Rank (STATR)

Values for this variable are available for 44 of the 140 survey respondents. The values are extracted from state admission centre records. Figure 6.19 shows a histogram of the Special Tertiary Admissions Test Rank values for the 44 students whose STATR values are recorded.

The histogram presented in Figure 6.19, shows the range of Special Tertiary Admissions Test Rank values, in percentile rank, recorded for the VET entrant survey sample. Only 44 of the 140 students have a recorded STATR value according to state admission centre records. This indicates that more than half the students in the survey sample may not have sat for a Special Tertiary Admissions Test (STAT). For the 44 students that did sit for the STAT and recorded a rank value, their ranks are evenly spread around a mean value of 67.73 with a standard deviation of 14.75. Entrance STATR cut-off values are not published for the university. However if this variable is equated to High School Rank, the STAT rank values for the VET Entrant Survey Sample are different in general terms than the High School Rank values. This indicates that while many of these students may have struggled to complete high school in their high school years, if they undertook a STAT, they tended to perform better.



**Figure 6.19 VET entrant students special tertiary admissions test rank scores (STATR).**

Special Tertiary Admission rank scores achieved by the individual VET entrant students in the survey sample.

The low number of VET entrants having either a Student High School Rank (60 of 140) or a Special Tertiary Admissions Test Rank (44 of 140) prevents the use of these two academic ability variables from being used in subsequent analyses. They are kept solely within this descriptive section of the thesis. The descriptive statistics for these two variable indicate that this group of

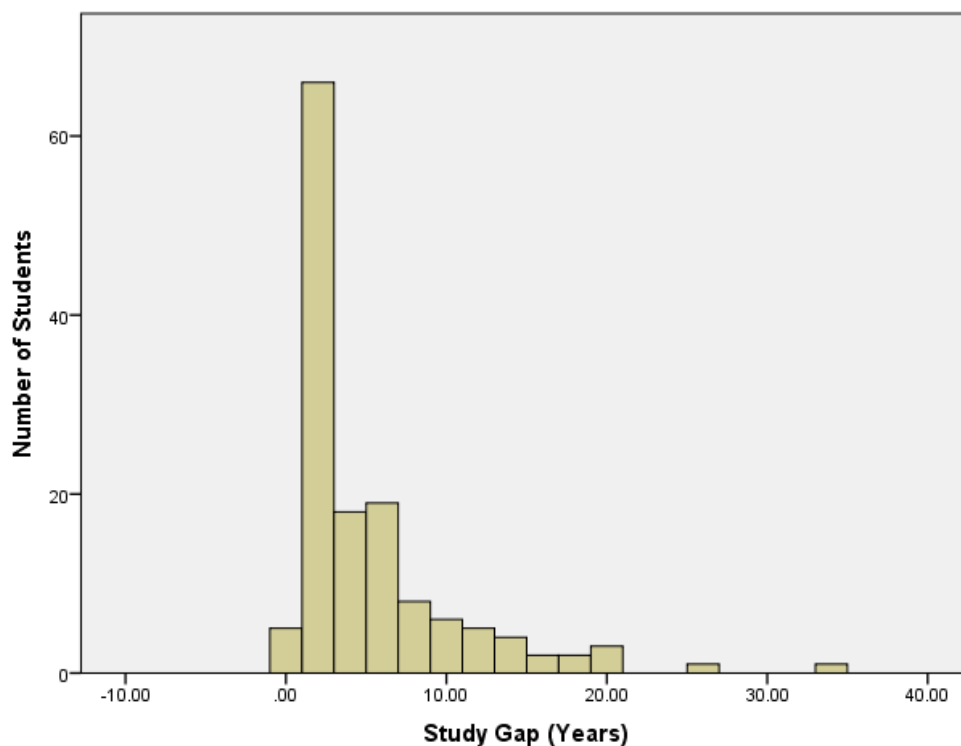
students is particular in nature. For a variety of reasons, these students have not been able to obtain the normal set of prerequisites that allows traditional entry into the university. For this group of students, a variable which addresses students' academic ability, and is available, is the students' highest level of VET qualification level achieved.

#### VET Qualification Level (VETQ)

The highest level of VET qualification achieved is termed in this investigation as VET Qualification Level. This variable is available for all 140 survey respondents and is extracted from state admission centre records. Descriptive statistics for this variable are given in Section 6.1 on page 163, in the comparison between the population and the survey sample.

#### Study Gap (SG)

Values for this variable are available for all 140 survey respondents. The study gap is assessed in years. It is calculated from the year of completion of the students' highest VET qualification as recorded in state admission centre records and the year of commencement of the students' university studies. The range of student study gaps is recorded in Figure 6.20.



**Figure 6.20 VET entrant students study gaps in years (SG).**



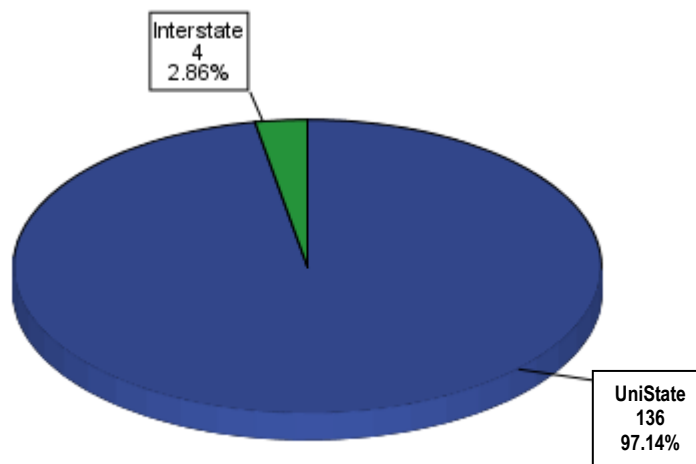
The histogram presented in Figure 6.20, shows the range of study gap values, in years, recorded for the VET entrant survey sample. This variable is considered as a continuous variable in the analyses described in later chapters. The study gap mean value is 4.82 years with a standard deviation of 5.42. The histogram records that 66 of the 144 survey respondent sample entered between one and two years after completing their highest VET qualification level course. It also records that several of the (older) students from the survey sample entered after an extended study gap period of 20 years or more.

#### Student Individual Attributes

Five student individual attribute variables are investigated in this study: Student State of Origin (SO); Student SES (SES); Student Gender (GEN); Student Age (AGE); and Language Background (ESB).

#### Student Home State (SO)

Values for this variable are available for all 140 survey respondents. The variable is of a dichotomous nature, with students either registering as coming from the state where the university is based, or from another state or territory. Each student's home state is available in both state admission centre and university records. As the state admission centre records pre-date the university records, the home state is extracted from state centre admission records rather than university records to attempt to record each student's 'original' home state. The proportions of students originating from the state where the university is based, to students from interstate are recorded in the pie chart in Figure 6.21.



**Figure 6.21 VET entrant students home state (SO).**

The pie chart presented in Figure 6.21 indicates that the majority (136 of 140) of students in the survey sample originated from the state where the university is based (UniState in the pie chart). Only four of the 140 students (2.86%) originated from another state or territory. This indicates that, at least for the VET entrant survey sample, very few students moved to the state to study. This trend has been noted previously in Australian universities (McInnis & James, 2004).

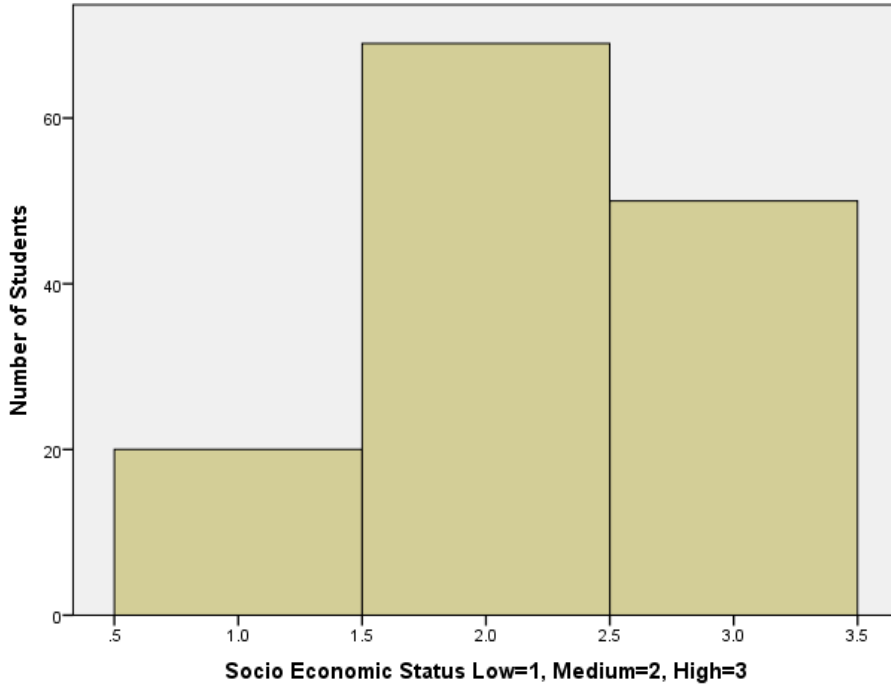
#### Student SES (SES)

Values for this variable are available for 139 of the 140 survey respondents. Each student's SES value is extracted from university records. In the university records, SES values are calculated from the students' home postcodes. The 2006 and 2011 Australian Bureau of Statistics Socio-Economic Indexes for Areas (SEIFA) Index of Education and Occupation are used to identify postcodes on a national scale as low, medium or high SES. Thus, each student is assigned one of three levels of SES by the university, depending on their home postcode. The three levels are:

1. low SES;
2. medium SES;
3. high SES.

In the general population, the low SES portion makes up 25 per cent of the total, the medium SES group makes up 50 per cent of the population, and the high SES group makes up the remaining 25 per cent of the population. This variable is ordinal in nature, going from a 'low' to a 'high' level, but the variable is treated as continuous in the analyses described in later chapters.

The proportions of students in each SES level for the survey sample are recorded in the histogram in Figure 6.22 and in Table 6.2.



**Figure 6.22 VET entrant students' socio economic statuses (SES).**

The histogram in Figure 6.22 shows that the students in the survey sample from a medium SES background are the largest group. The next largest is the High SES group of survey respondents. With the SES levels coded from low to medium to high as 1, 2 and 3, the variable is considered as continuous in the analyses described in later chapters. The Student SES recorded mean is 2.22 with a standard deviation of 0.68.

**Table 6.2 SES of Students in the VET Entrant Survey Respondent Sample**

SES	Number of Students	Percent
Low	20	14.3
Medium	69	49.3
High	50	35.7
Unknown	1	.7
	140	100.0

Table 6.2 presents more clearly how many of the 140 VET entrant survey respondent sample are assigned to each of the three SES levels. The table records that around 49 per cent of the 140

students are assessed as coming from a medium SES background. This proportion is very close to the general Australian population proportion of 50 per cent. The low SES students make up 14.3 per cent of the sample. This percentage is lower than the general population of 25 per cent, but within the range recorded for the whole university for the period between 2007 and 2012 of between 14 per cent and 18 per cent (Australian Government, 2014b). The table also indicates that one student has unknown SES background and is treated as a missing value in the analyses described in later chapters.

#### Student Gender (GEN)

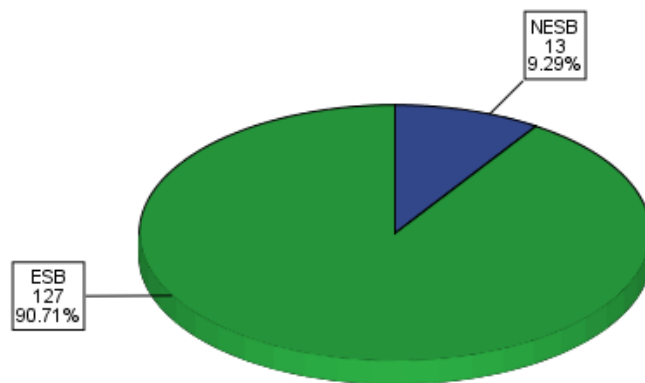
Descriptive statistics for this variable are presented in Section 6.1, in the comparison between the population and survey sample.

#### Student Age (AGE)

For this variable, see the comparison between the population and survey sample in Section 6.1.

#### Language Background (ESB)

Values for this variable are available for all 140 survey respondents. The variable is dichotomous in nature, with students either recorded as coming from an English Speaking Background (ESB), or from a Non-English Speaking Background (NESB). This variable is assessed using responses to Question 1 in the VET entrant student survey (Appendix 1). The proportions of ESB and NESB students are recorded in the pie chart in Figure 6.23.



**Figure 6.23 VET entrant students language backgrounds (ESB).**

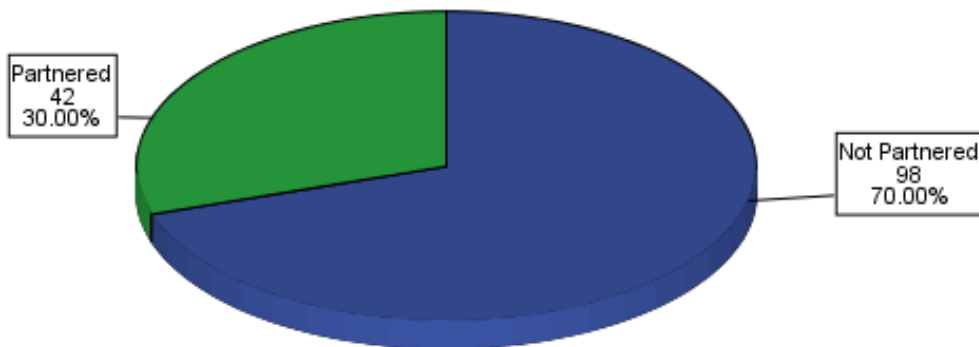
The pie chart presented in Figure 6.23 shows that the majority (127 of 140 or 90.71%) of students in the survey sample recorded themselves as native English speakers, termed in this study as coming from an 'English Speaking Background' (ESB). The remaining proportion of students (13 of 140 or 9.29%) recorded themselves as native speakers of other languages, termed in this study as 'Non-English Speaking Background' (NESB).

#### External pressures

Four 'external pressures' variables are investigated in this study: Partnered Status (PS); Dependents (DEP); Working Hours per Week (WHPW); and Financial Support (FS).

#### Partnered Status (PS)

Values for this variable are available for all 140 survey respondents. The variable is assessed using responses to Question 2 in the VET entrant student survey (Appendix 1). Partnered status is calculated by adding the students that indicated they were married when first enrolling at the university with students that indicated they were in a defacto relationship in the same question in the survey under the 'other' option (see Appendix 1). This variable is dichotomous in nature. The proportions of 'partnered' and 'not partnered' students are recorded in the pie chart in Figure 6.24.

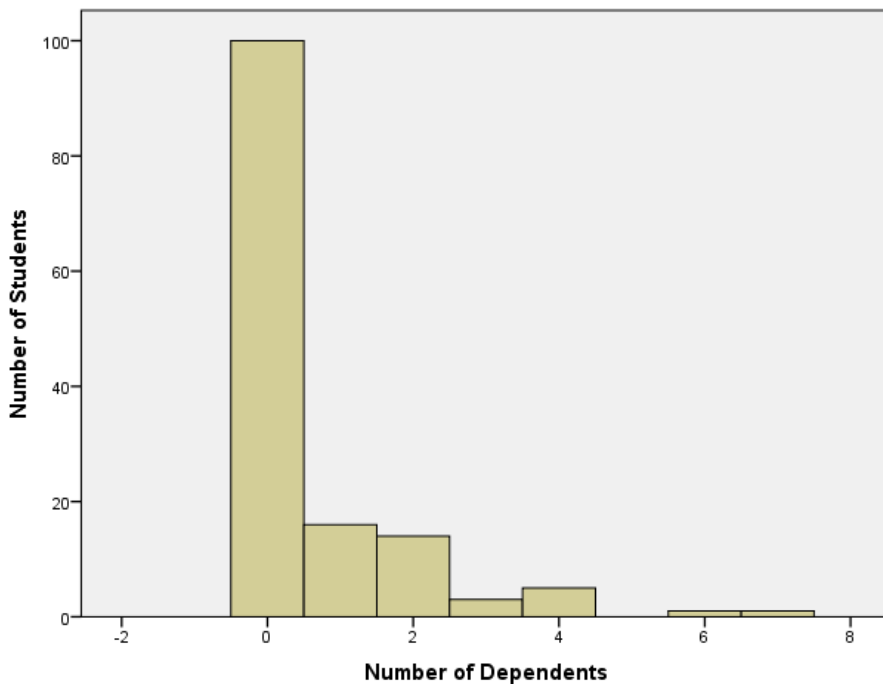


**Figure 6.24 VET entrant students partnered statuses (PS).**

The pie chart presented in Figure Figure 6.24 shows that the majority (98 of 140 or 70%) of students in the survey sample record themselves as married or in a defacto relationship when first enrolling at the university, termed in this study as 'Partnered'. The remaining proportion of students (42 of 140 or 30%) record themselves as not married or separated, termed in this study as 'Not Partnered'.

#### Dependents (DEP)

Values for this variable are available for all 140 survey respondents. The variable is assessed using responses to Question 3 in the VET entrant student survey (Appendix 1). The range in number of dependents recorded for students in the survey sample is shown in the histogram in Figure 6.25.



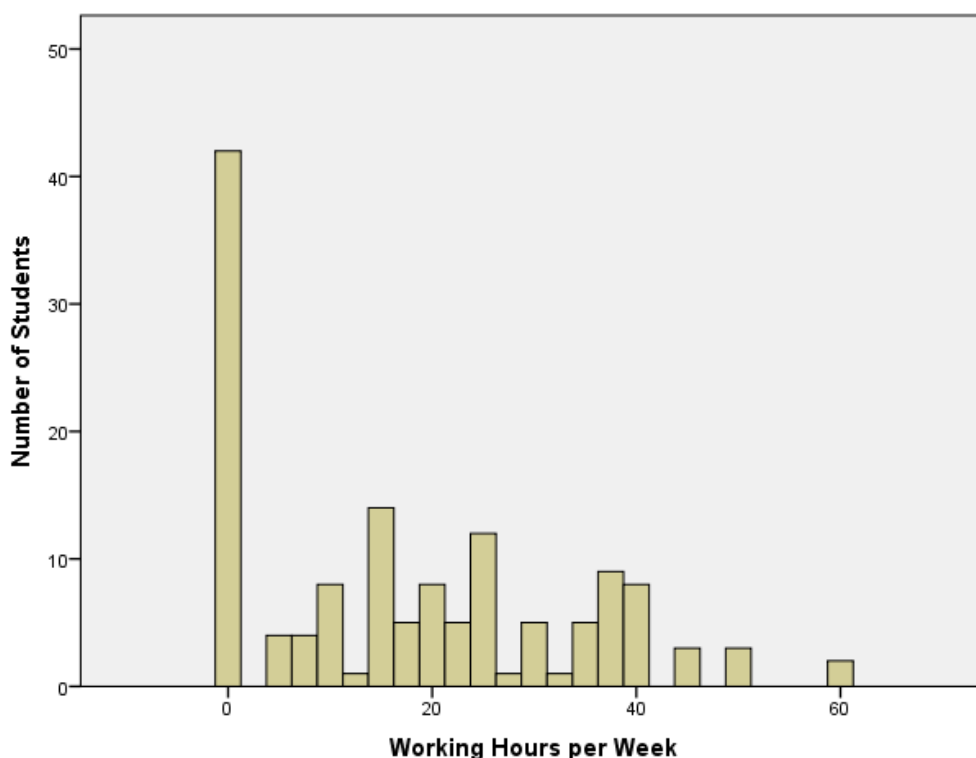
**Figure 6.25 VET entrant students dependents (DEP).**

Number of dependents of VET entrant students in survey sample

The histogram presented in Figure 6.25, shows the number of students recorded as having between zero and seven dependents when first enrolling into the university. The majority of the survey sample (100 of 140) are recorded as having no dependents when first enrolling at the university. For students who are recorded as having dependents, the number of dependents ranges between one and seven. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for the number of dependents is 0.61 with a standard deviation value of 1.23. The figures for this variable and the previous variable, Partnered Status, indicate that the majority of students in the survey sample are not partnered and have no dependents under their care.

#### Working Hours per Week (WHPW)

Values for this variable are available for all 140 survey respondents. The variable is assessed using responses to Question 5 in the VET entrant student survey (Appendix 1). The range in number of working hours per week recorded for the survey sample is shown in Figure 6.26.



**Figure 6.26 VET entrant students working hours per week (WHPW).**  
 Number of hours worked per week by VET entrant students in the survey sample.

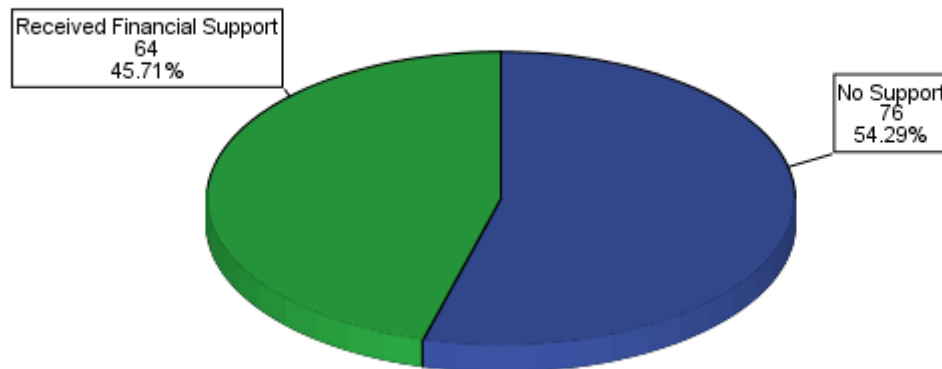
The histogram, presented in Figure 6.26, shows that the survey sample students recorded having between zero and 60 hours per week of outside work, in their first year of enrolment at the university. However, a large number of students in the survey sample (42 of 140) also are recorded as having not worked any hours when first enrolling at the university. For students that are recorded as having worked (98 of 140), the number of working hours per week ranges between four and 60. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for working hour per week is 17.63 hours with a standard deviation value of 15.80. The histogram indicates that while many of the students do not work when first enrolling at the university, some work a full-time allotment of hours (37.5 hours per week) or more, to supplement their income.

### Financial Support (FS)

Values for this variable are available for all 140 survey respondents. The variable is assessed using responses to Question 6 in the VET entrant student survey (Appendix 1). Financial Support is calculated by adding the students who indicated receiving financial support, outside of work, with students who indicated receiving some other monetary support in the same question in the



survey under the 'other' option (Appendix 1). This variable is dichotomous in nature. The proportions of 'no support' and 'received financial support' students are recorded in the pie chart in Figure 6.27.



**Figure 6.27 VET entrant students financial support statuses (FS).**

The pie chart presented in Figure 6.27 indicates that just over half (76 of 140 or 54.29%) of the students in the survey respondent sample recorded themselves as not receiving any financial support, outside of work. The remaining proportion of students (64 of 140 or 45.71%) recorded themselves as receiving some form of financial support, outside of work.

#### 6.2.3.2 Student Entry Characteristics

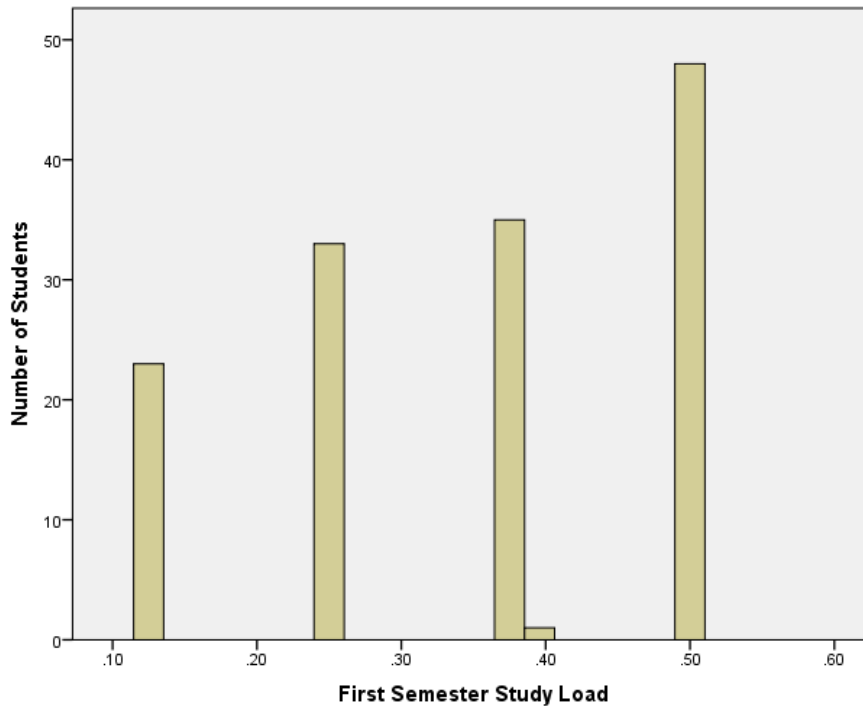
##### Student Enrolment Status

Two 'student enrolment status' variables are investigated in this study: Student Study Load (FTR); and Student Admit Semester (SEM).

##### Student Study Load (FTR)

Values for this variable are available for all 140 survey respondents. The values are extracted from university records. The figure extracted is the study load in the first semester of enrolment for each of the students in the survey sample. Study loads are based on a full-time load for the

whole year being a value of 1.00. The corresponding full time load for one semester is a value of 0.50. Studying a full time load for most programs at the university involves studying four first year subjects per semester, with each subject having a study load value of 0.125 (0.13 when rounded to two decimal places). The range in study load values for the first semester of enrolment recorded for the survey sample is shown in Figure 6.28.



**Figure 6.28 VET entrant students first semester study loads (FTR).**

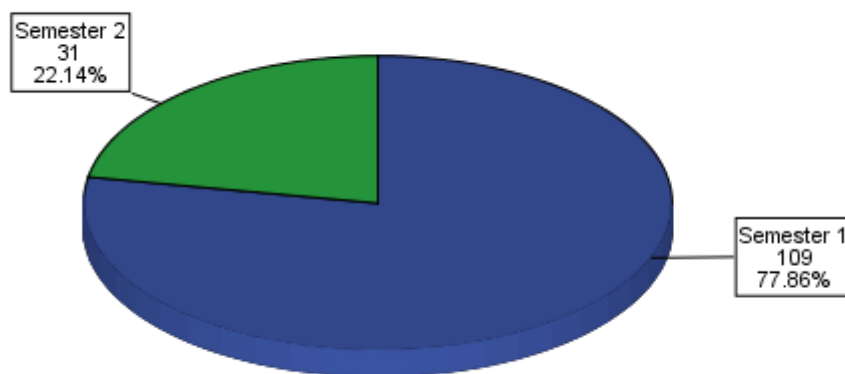
VET entrant students study load. (0.50=full study load, 0.25=half study load)

The histogram, presented in Figure 6.28, shows that the students are recorded as having between zero and 0.50 study load for the first semester of enrolment at the university. The histogram clearly indicates how students either study one first year subject (FTR=0.13), two first year subjects (FTR=0.25), three first year subjects (FTR=0.38), or the full time equivalent of four first year subjects (FTR=0.50). The largest number of the VET entrant survey respondents (48 of 140) are recorded as having a full time load (FTR=0.50) in their first semester of enrolment at the university. Fewer students (35 of 140) are recorded as having a three quarter load (FTR=0.38). In addition 33 (of 140) students are recorded as having a half load (FTR=0.25) and 23 (of 140), are recorded as having a one quarter load (FTR=0.13). Note that one student is recorded as having an unusual study load of 0.70. This variable is considered as a continuous variable in the

analyses described in later chapters. The mean value for the student study load is 0.35 with a standard deviation value of 0.14.

#### Student Admit Semester (SEM)

Values for this variable are available for all 140 survey respondents. The values for this variable are extracted from university records. Students are recorded as either being admitted for the first time into the university in 'Semester 1' or in Semester 2'. This variable is dichotomous in nature. The proportions of 'Semester 1' and 'Semester 2' students are recorded in the pie chart in Figure 6.29.



**Figure 6.29 VET entrant students admit semesters (SEM).**

VET entrant students enrolled in semester 1 or semester 2 when first admitted to the university.

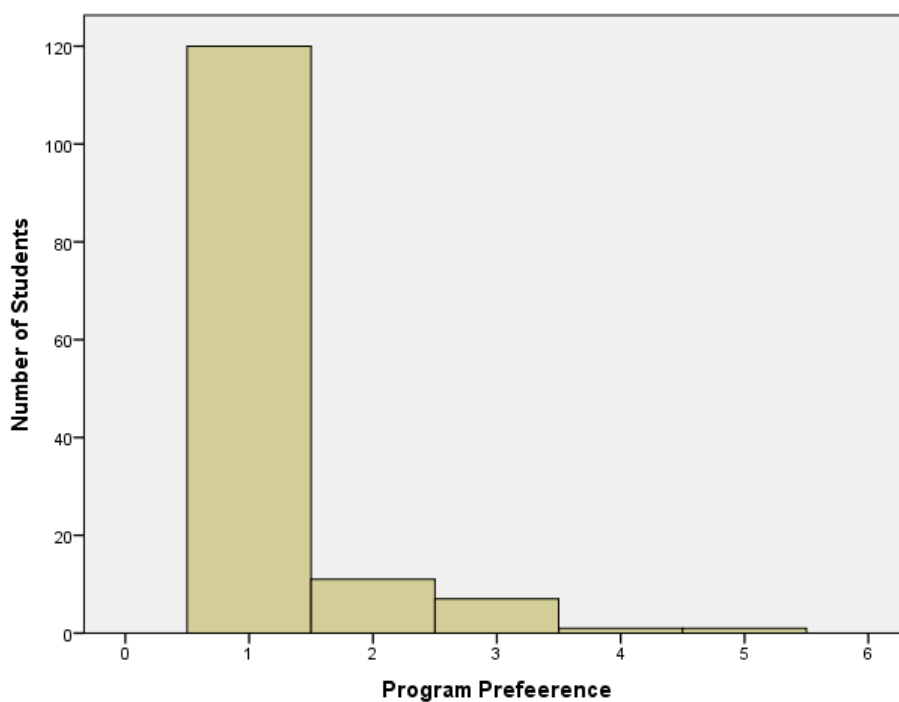
The pie chart, presented in Figure 6.29, indicates that the majority (109 of 140 or 77.86%) of students in the survey sample are recorded as being admitted into the university in the first semester. The remaining proportion of students (31 of 140 or 22.14%) are recorded as being admitted in the second semester.

#### Pre-Entry Institutional Commitment

Two 'pre-entry institutional commitment' variables are investigated in this study: Program Preference (PROGP); and University Preference (UNIP).

### Program Preference (PROGP)

Values for this variable are available for all 140 survey respondents. The values are extracted from state admission centre records. The figure extracted is the program preference given by each student before enrolling for the program into which the student eventually enters. The possible values for Program Preference are between one and five, with one being recorded if the student enters the program he or she had given as the first preference, and five if the student enters the program he or she had given as the fifth preference. The range in Program Preference values recorded for the survey sample is recorded in Figure 6.30.

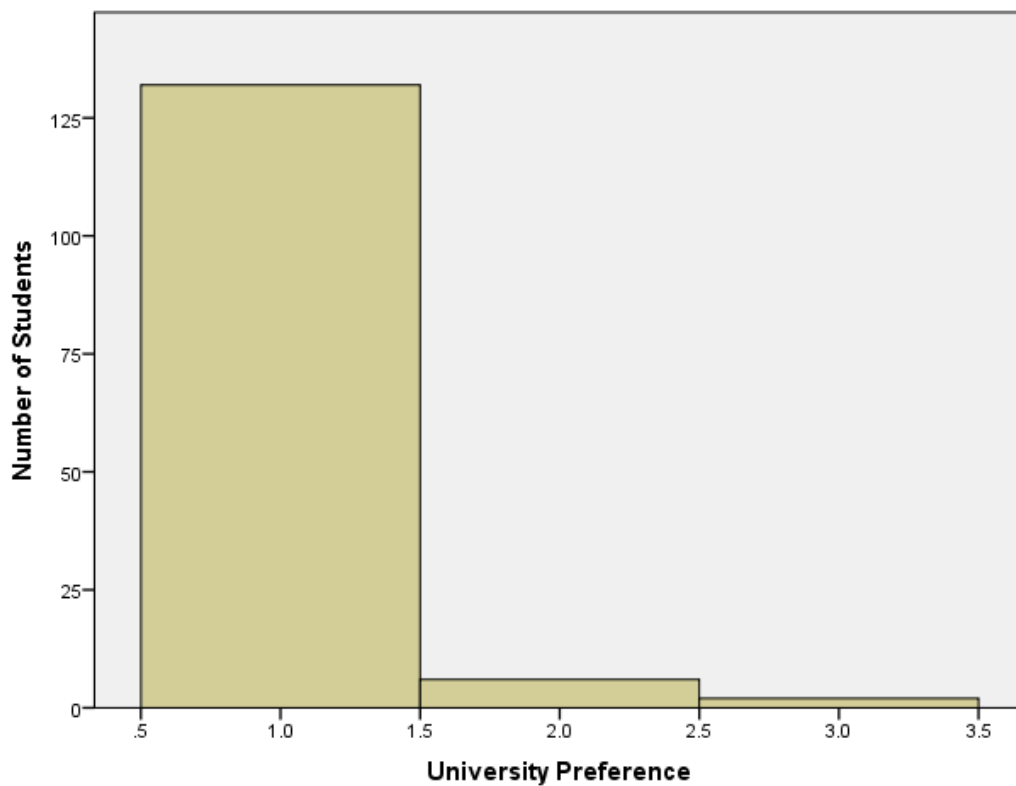


**Figure 6.30 VET entrant students program preferences (PROGP).**  
VET entrant student program preference (1-5) prior to entry of the program they enrolled into.

The histogram, presented in Figure 6.30, records the students' program preference for the program in which they eventually enrol. The histogram clearly indicates that most students (120 of the 140 or 85.7%) enrol into the program that they had chosen as their first preference. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for the variable is 1.23 with a standard deviation of 0.64.

## University Preference (UNIP)

Values for this variable are available for all 140 survey respondents. The values are extracted from state admission centre records. The figure extracted is the university preference given by each student before enrolling into the university for which the student eventually enters. The possible values for University Preference are between one and five, with one being recorded if the student enters the university he or she had given as the first preference, and five if the student enters the university he or she had given as the fifth preference. The range in University Preference values recorded for the survey sample is shown in Figure 6.31.



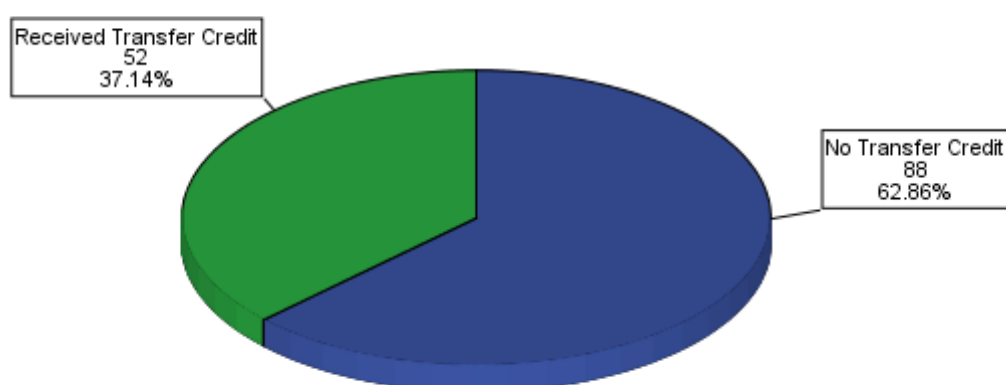
**Figure 6.31 VET entrant students university preferences (UNIP).**

VET entrant student university preference (1-5) prior to entry of the university.

The histogram, presented in Figure 6.31, records the students' university preference for the university into which they eventually enter. The histogram clearly indicates that most students (132 of the 140 or 94.3%) enter into the university that they chose as their first preference. It also indicates that no students in the survey sample selected the university as either their fourth or fifth preference. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for the UniPref is 1.07 with a standard deviation of 0.31.

## Transfer Credit (TC)

Values for this variable are available for all 140 survey respondents. Values for the variable are extracted from university records. Students are recorded, either, as having received some transfer credit for their studies prior to entering, or as having received no transfer credit. In order to be assessed as a recipient of credit, the transfer credit needed to be recorded as being received in the first year of enrolment. This variable is dichotomous in nature. The proportions of students who 'Received Transfer Credit' and those who received 'No Transfer Credit' are recorded in the pie chart in Figure 6.32.



**Figure 6.32 VET entrant students receiving transfer credit (TC).**

The pie chart, presented in Figure 6.32, indicates that most (88 of 140 or 62.86%) of the students in the survey sample are recorded as not having received any transfer credit for their studies prior to their first enrolment, in their first year of enrolment at the university. The remaining proportion of students (52 of 140 or 37.14%) are recorded as having received some transfer credit in the first year of enrolment at the university for studies completed prior to their first enrolment. The descriptive statistics for this variable indicate that many of the VET entrants either refused the transfer credit available to them according to pathway agreements, or that they simply are unaware of the transfer credit options. This finding has been noted in an internal report at the university.

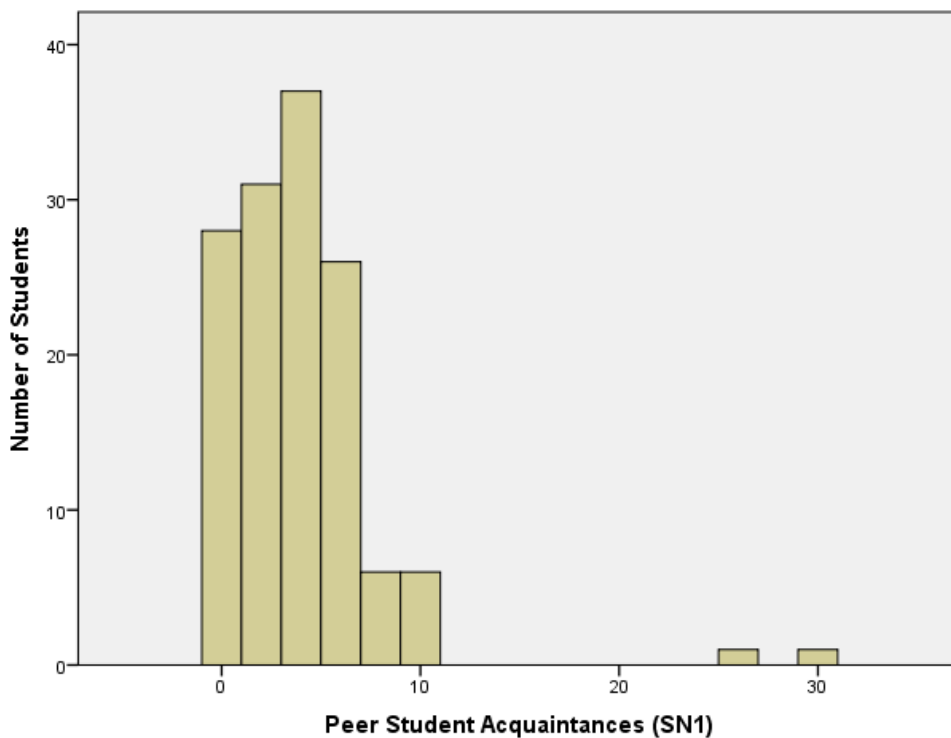
### 6.2.3.3 Student Experiences and Attitudes

#### Student Network Sizes

Four 'student network size' variables are investigated in this study: Peer Student Acquaintances (SN1); Peer Student Close Friends (SN2); Peer Student Academic Advisers (SN3); and Peer Student Social Advisers (SN4).

#### Peer Student Acquaintances (SN1)

Values for this variable are available for 136 of the 140 survey respondents. The variable is assessed using responses to Question 39 in the VET entrant student survey (Appendix 1). This variable is considered to be continuous in the analyses described in later chapters in this study. The range in number of peer student acquaintances for students in the survey sample is shown in Figure 6.33.



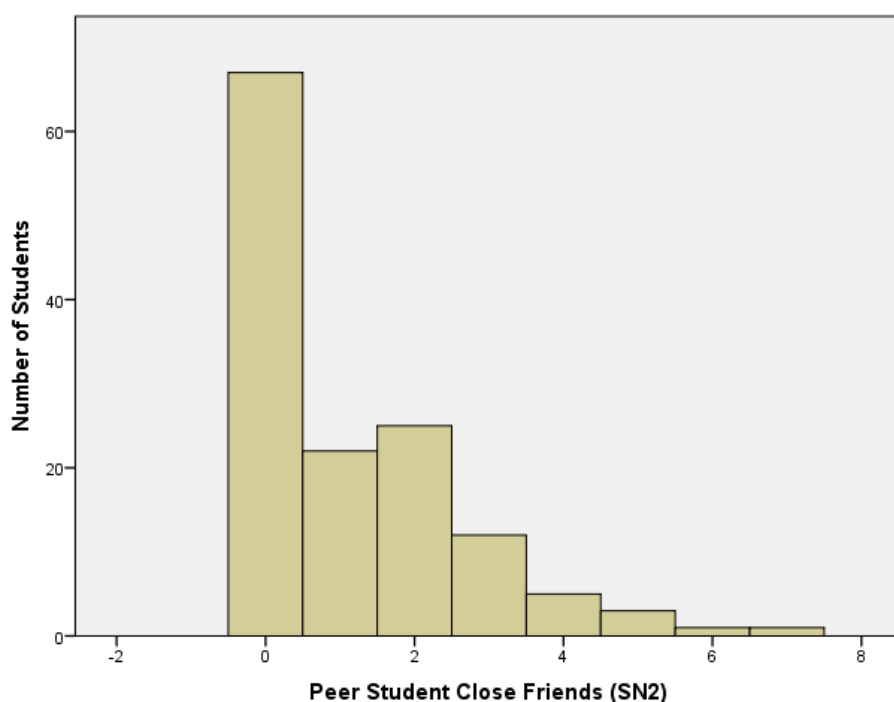
**Figure 6.33 VET entrant students peer student acquaintances (SN1).**  
Number of acquaintances among peers made in first year of enrolment by VET entrant students.

The histogram, presented in Figure 6.33, records the students as having between zero and 30 peer student acquaintances in their first year of enrolment at the university. The mean value for this variable is 3.49 with a standard deviation value of 3.85. Thus, on average, the student in the

VET entrant survey respondent sample has between three and four acquaintances among their peers in their first year of enrolment.

### Peer Student Close Friends (SN2)

Values for this variable are available for 136 of the 140 survey respondents. The variable is assessed using responses to Question 40 in the VET entrant student survey (Appendix 1). The range in number of peer student close friends for students in the survey sample is shown in Figure 6.34.



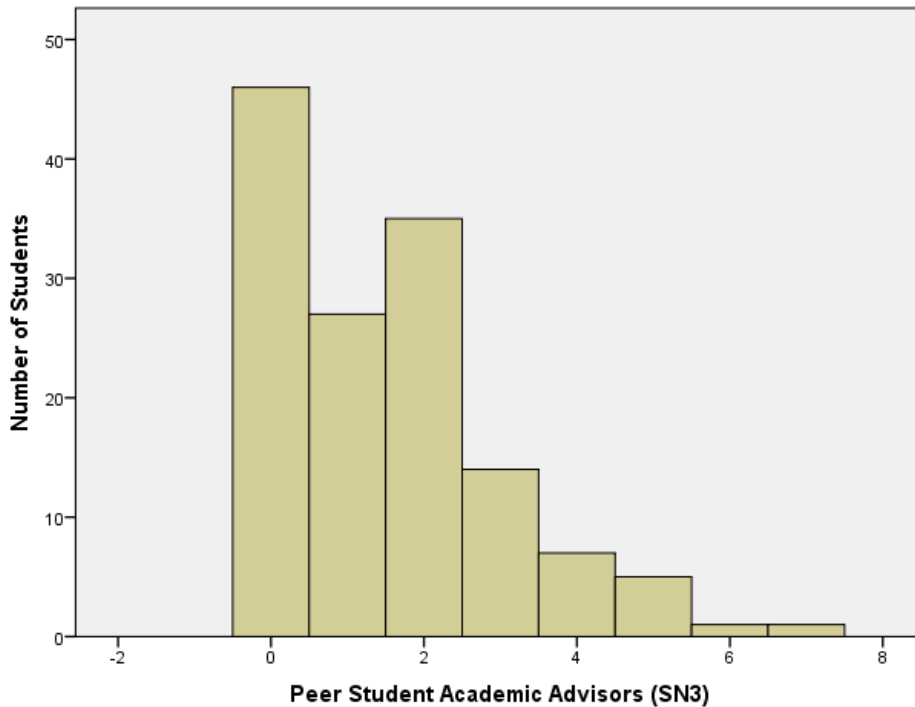
**Figure 6.34 VET entrant students peer student close friends (SN2).**  
Number of close friends among peers made in first year of enrolment by VET entrant students.

The histogram, presented in Figure 6.34, records the students as having between zero and seven peer student close friends in their first year of enrolment at the university. This variable is considered as a continuous variable in the analyses discussed in later chapters. The mean value for this variable is 1.15 with a standard deviation value of 1.47. Thus, on average, each student in the VET entrant survey respondent sample had one close friend amongst their peers in their first year of enrolment. It is important to recognize, however, that almost half (67 of 136) of the survey sample students had no close friends at all in their first year of enrolment.



### Peer Student Academic Advisers (SN3)

Values for this variable are available for 136 of the 140 survey respondents. The variable is assessed using responses to Question 41 in the VET entrant student survey (Appendix 1). The range in number of peer student academic advisers for students in the survey sample is shown in Figure 6.35.



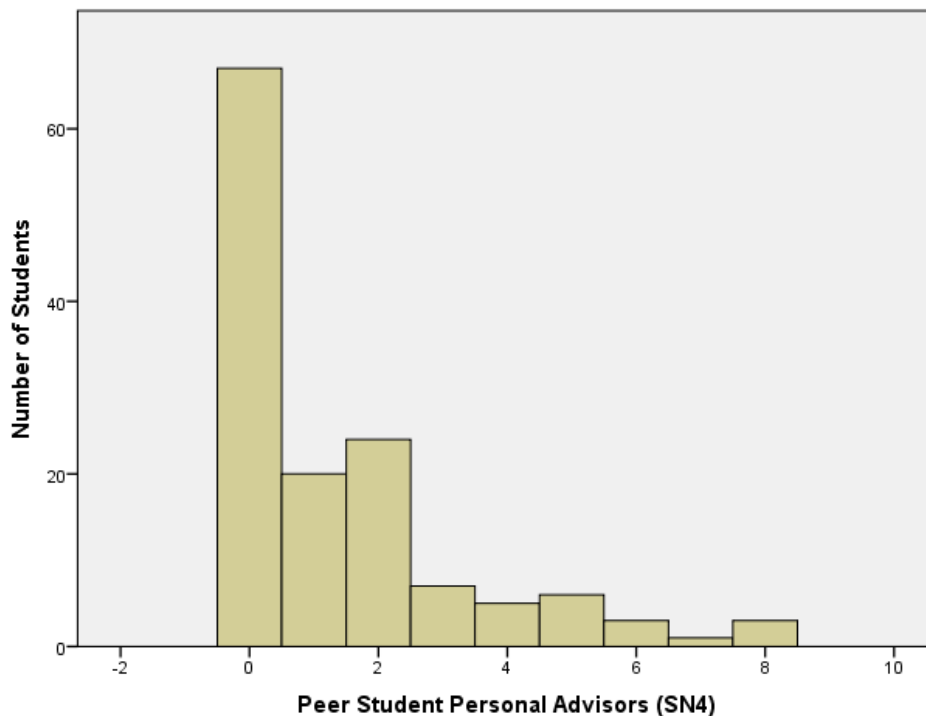
**Figure 6.35 VET entrant students peer student academic advisers (SN3).**  
Number of academic advisers among peers made in first year of enrolment by VET entrant students.

The histogram presented in Figure 6.35, records the number of students as having between zero and seven peer student academic advisers in their first year of enrolment at the university. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for this variable is 1.51 with a standard deviation value of 1.51. Thus, on average, each student in the VET entrant survey respondent sample had between one and two academic advisers amongst their peers in their first year of enrolment.

### Peer Student Social Advisers (SN4)

Values for this variable are available for 136 of the 140 survey respondents. The variable is assessed using responses to Question 42 in the VET entrant student survey (Appendix 1). The

range in number of peer student social advisers for students in the survey respondent sample is shown in Figure 6.36.



**Figure 6.36 VET entrant students peer student social advisers (SN4).**  
Number of social advisers amongst peers made in first year of enrolment by VET entrant students.

The histogram, presented in Figure 6.36, records the number of students as having between zero and eight peer student social advisers in their first year of enrolment at the university. This variable is considered as a continuous variable in the analyses described in the later chapters. The mean value is 1.38 with a standard deviation value of 1.92. Thus, on average, the student in the VET entrant survey respondent sample had between one and two social advisers amongst their peers in their first year of enrolment. It is important to recognize that, similar to the values recorded in the Peer Student Close Friends variable, almost half (67 of 136) of the survey sample students had no peer student to turn to for social advice.

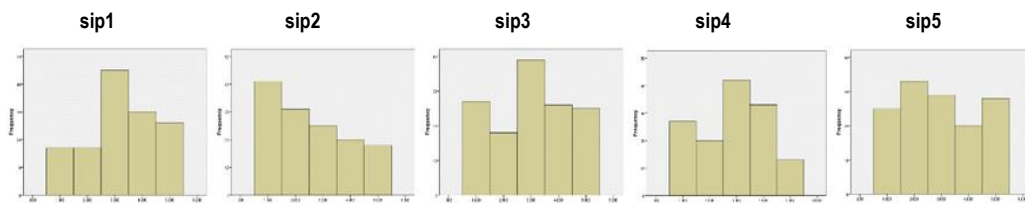
The descriptive statistics for the seven latent scales employed in this investigation comprise a set of histograms to describe the distribution of the individual items in each scale and a set of error bars to describe the central tendencies, that is, the mean and confidence limits of the individual items in each of the seven scales.

Social Integration

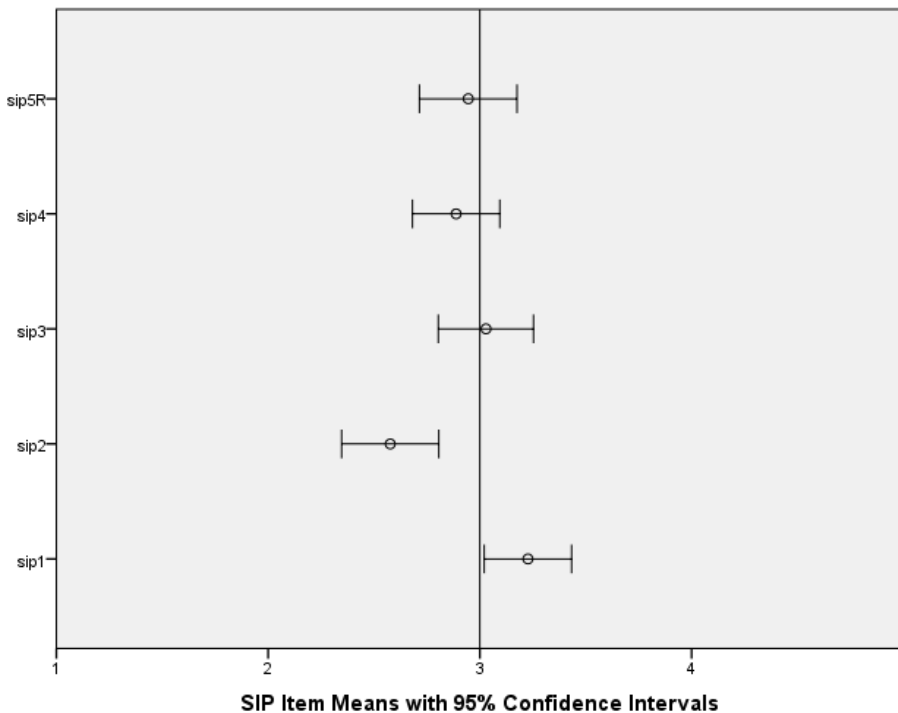
The Social Integration factor is assessed using two latent variables: Social integration with Peers (SIP); and Social Integration with Staff (SIS).

### Social Integration with Peers (SIP)

The concept of Social Integration with Peers is assessed in this investigation as a latent variable indicated by five separate items. The five items correspond to Questions 43, 44, 45, 46 and 47 in the VET entrant student survey (Appendix 1). Responses for all five items are available for 135 of the 140 survey respondents. The construct validity of the five-item 'Social Integration with Peers' construct is discussed in Chapter 5, Section 5.2. Figure 6.37 and Figure 6.38, give a visual summary of how the respondents answered the five 'Social Integration with Peers' items.



**Figure 6.37 VET entrant survey sample, SIP item response distributions.**



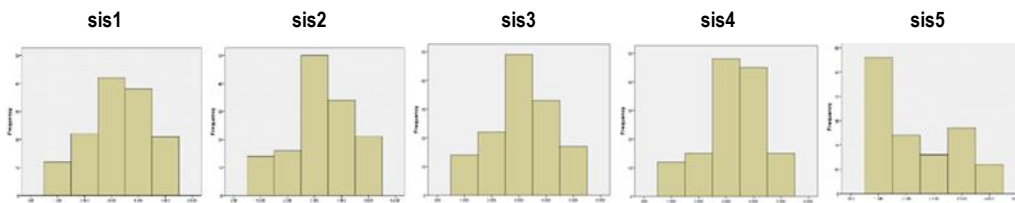
**Figure 6.38 VET entrant survey sample, SIP item response means and confidence intervals.**

The set of histograms presented in Figure 6.37 and the error bar diagram presented in Figure 6.38, indicate how the respondents answer the five SIP items. The figures show that many respondents chose the middle option for the five items. The sip1 item is recorded as having more responses towards the 'agree' end of the scale. This item is more general in nature than the other four. The wording is around student friendships as opposed to personal relationships, which are expressed in the items sip3, sip4 and sip5R. Respondents were more likely to agree with the sip1 statement indicating many of the respondents as having friendships of a general nature. Conversely, the sip2 item is recorded as having more responses towards the 'disagree' end of the scale. This item is associated with 'close' personal relationships and was less likely to be responded to in a positive manner.

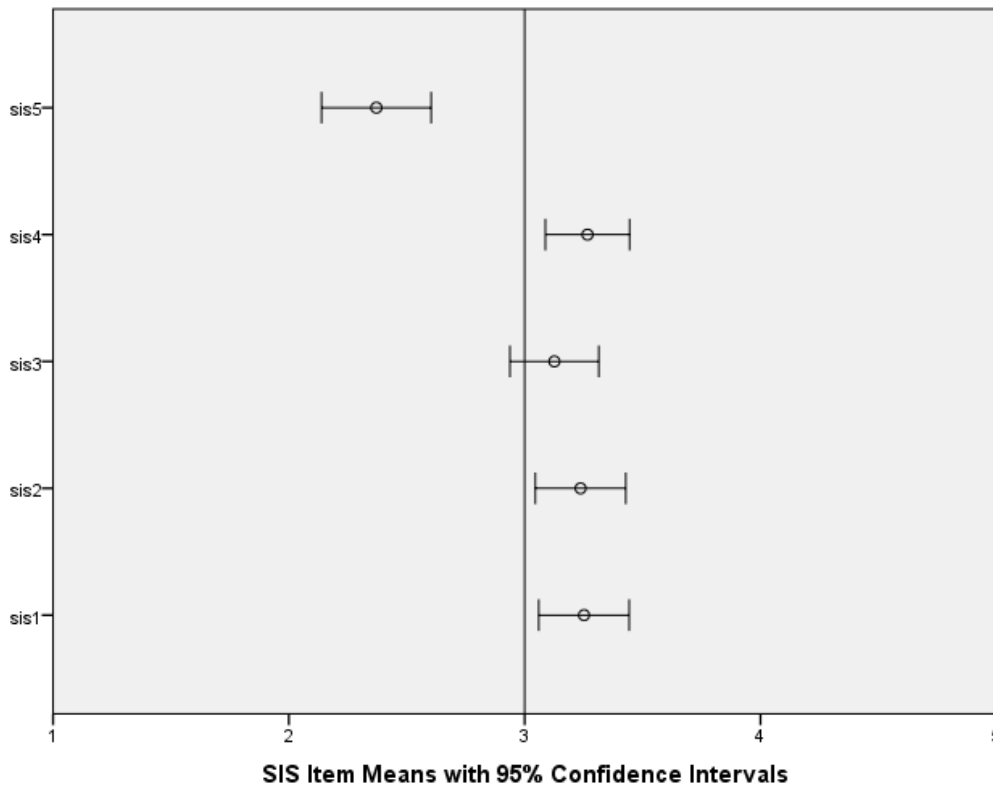
### Social Integration with Staff (SIS)

The concept of Social Integration with Staff is assessed in this investigation as a latent variable indicated by five separate items. The five items correspond to Questions 48, 49, 50, 51 and 52 in the VET entrant student survey (Appendix 1). Responses for all five SIS items are available for 135 of the 140 survey respondents. The construct validity of the five-item 'Social Integration with Staff' construct is discussed in Chapter 5, Section 5.2. Figure 6.40 and Figure 6.39 give a visual summary of how the respondents answer the five 'Social Integration with Staff' items.

The set of histograms in Figure 6.39 and the error bar diagram shown in Figure 6.40, indicate how the respondents answer the five 'Social Integration with Staff' items. The diagrams indicate that most respondents chose the middle option or slightly above for the four of the five items. These four items assess the relationships between the survey respondents and the academic lecturing staff. This suggests that most VET entrants had (mildly) positive relationships with the academic staff. In contrast, the item sis5 is the only item in this group that involves the relationship with administrative staff. For this item, the responses are recorded as being at the 'disagree' end of the scale. This indicates that the respondents are less likely to be positive about their relationships with the administrative staff at the university than they are about the academic staff.



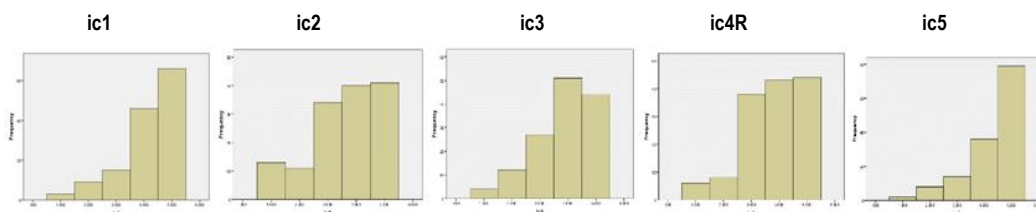
**Figure 6.39 VET entrant survey sample, SIS item response distributions.**



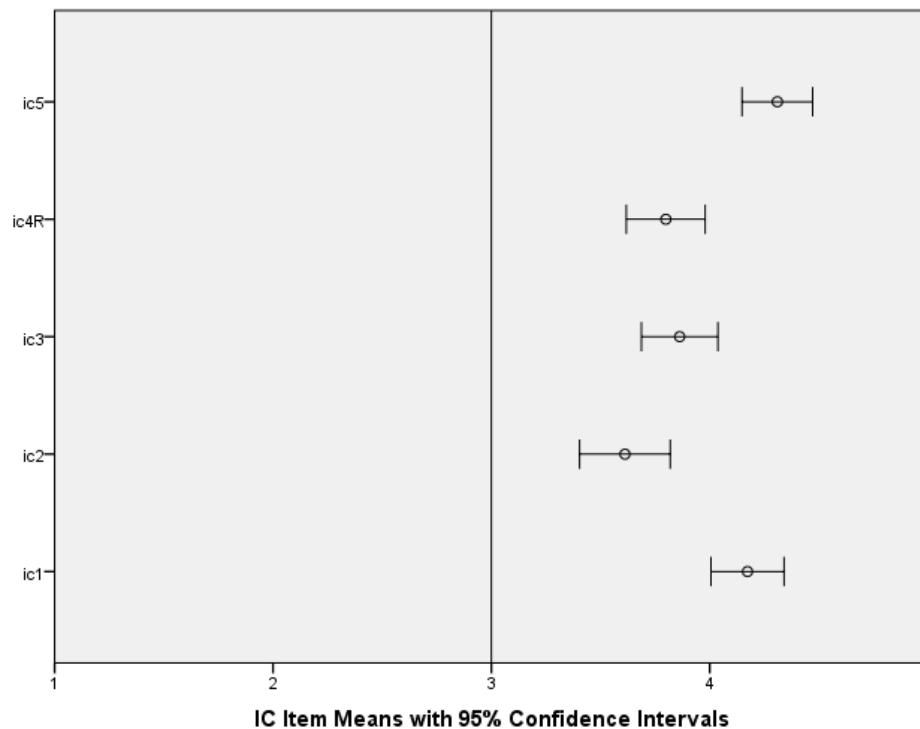
**Figure 6.40 VET entrant survey sample, SIS item response means and confidence intervals.**

### Institutional Commitment (IC)

The concept of Institutional Commitment is assessed in this investigation as a latent variable indicated by five separate items. The five items correspond to Questions 12, 13, 14, 15 and 16 in the VET entrant student survey (Appendix 1). Responses for all five items are available for 138 of the 140 survey respondents. The construct validity of the five-item Institutional Commitment construct is discussed in Chapter 5, Section 5.3. Figure 6.42 and Figure 6.41, give a visual summary of how the respondents answer the five Institutional Commitment items.



**Figure 6.41 VET entrant survey sample, IC item response distributions.**

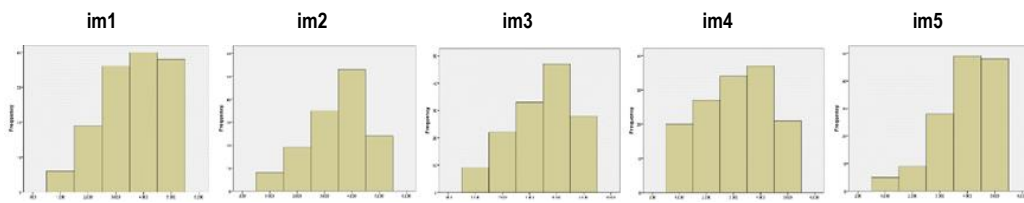


**Figure 6.42 VET entrant survey sample, IC item response means and confidence intervals.**

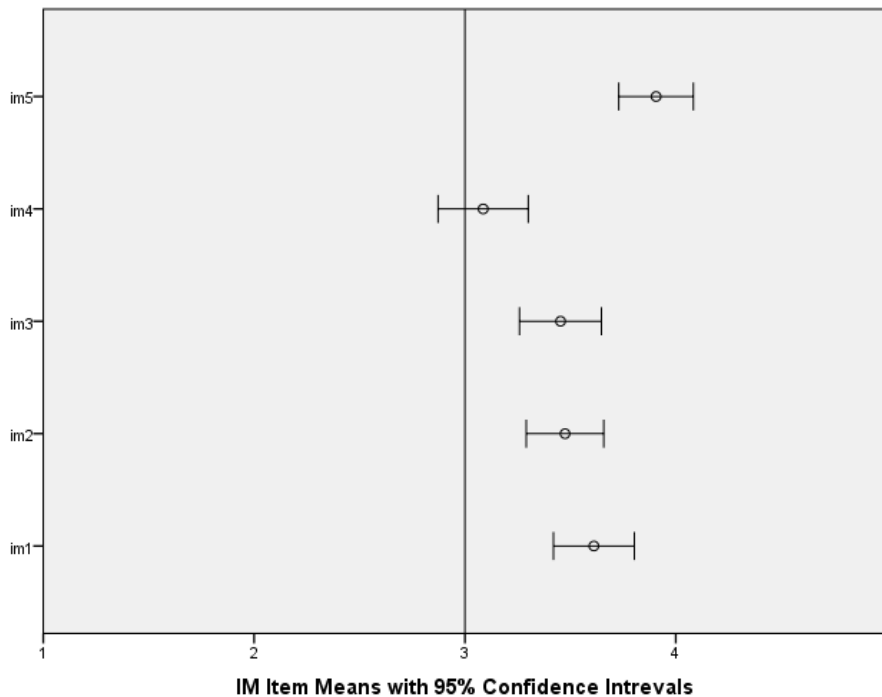
The set of histograms in Figure 6.41 and the error bar diagram shown in Figure 6.42, record how the respondents answer the five 'Institutional Commitment' items. The diagrams indicate that respondents tend to choose the 'agree' end of the scale for all five items. This shows that most VET entrants record themselves as having a strong commitment to being at the university. The item ic5 is recorded as having the highest mean. This item is particularly relevant to the investigation topic, as it assesses the respondents' expectation of graduating from the university. This indicates that during their first year of enrolment, students have little intention to withdraw or drop out from their studies. As the university is considered as the most prestigious in the state and a member of the 'Group of Eight' universities (Group of Eight Australia, 2014), the strong commitment to stay at the university is not surprising.

## Institutional Membership (IM)

The concept of Institutional Membership is assessed, in this investigation, as a latent variable indicated by five separate items. The five items correspond to Questions 17, 18, 19, 20 and 21 in the VET entrant student survey (Appendix 1). Responses for all five items are available for 138 of the 140 survey respondents. The construct validity of the five-item Institutional Membership construct is discussed in Chapter 5, Section 5.3. Figure 6.44 and Figure 6.43, below, give a visual summary of how the respondents answer the five Institutional Membership items.



**Figure 6.43 VET entrant survey sample, IM item response distributions.**



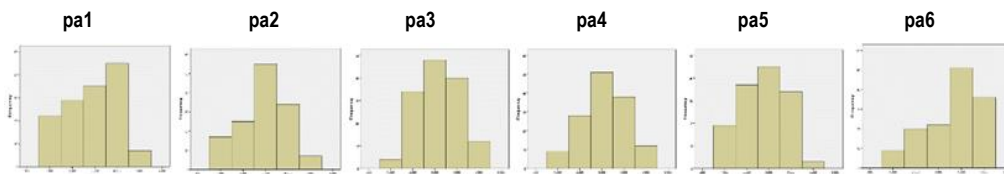
**Figure 6.44 VET entrant survey sample, IM item response means and confidence intervals.**

The set of histograms in Figure 6.43 and the error bar diagram shown in Figure 6.44, record how the respondents answer the five 'Institutional Membership' items. The diagrams show that respondents tend to choose the 'agree' end of the scale for all five items. This indicates that most survey sample students record themselves as having a positive feeling towards being a member

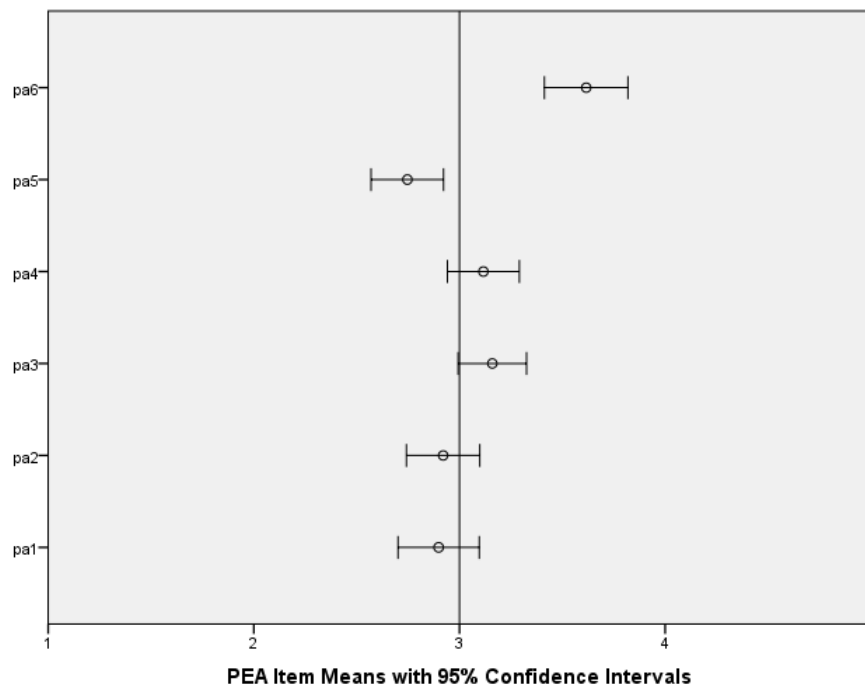
of the university. The item im4 is recorded as having the lowest mean. This item assesses the students' emotional attachment and in this regard, therefore, most of the students are recorded as being more neutral.

### Perceived Educational Ability (PEA)

The concept of Perceived Educational Ability is assessed, in this investigation, as a latent variable indicated by six separate items. The six items correspond to Questions 22, 23, 24, 25, 26 and 27 in the VET entrant student survey (Appendix 1). Responses for all six items are available for 138 of the 140 survey respondents. The construct validity of the six-item Perceived Educational Ability construct is discussed in Chapter 5, Section 5.4. Figure 6.46 and Figure 6.45, below, give a visual summary of how the respondents answer the six Perceived Educational Ability items.



**Figure 6.45 VET entrant survey sample, PEA item response distributions.**



**Figure 6.46 VET entrant survey sample, PEA item response means and confidence intervals.**

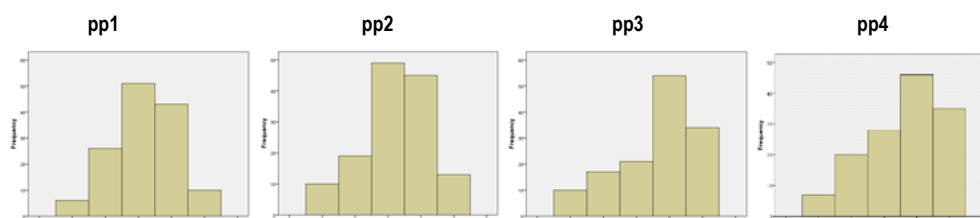


The set of histograms shown in Figure 6.45 and the error bar diagram shown in Figure 6.46, record how the respondents answer the six Perceived Educational Ability items. The diagrams show that most respondents chose the middle option for four of the six items. The pa6 item is recorded as having more responses towards the 'agree' end of the scale. This item is assessing whether respondents had the confidence in achieving a 'Pass' grade. A similar trend is also recorded for the pa3 item. The item mean for this item is slightly above the middle option. The grade in this item is described as 'acceptable'. A slightly different concept appears to be assessed by the other three items. The wording in items pa1, pa2, and pa4 differ and it is possible that these items assessed whether respondents were confident of achieving the grades they 'wanted'. Thus, the responses for the six Perceived Educational Ability items indicate that during their first year of enrolment, students have the confidence of achieving at least a Pass, or acceptable, grade but less so of achieving their desired grades.

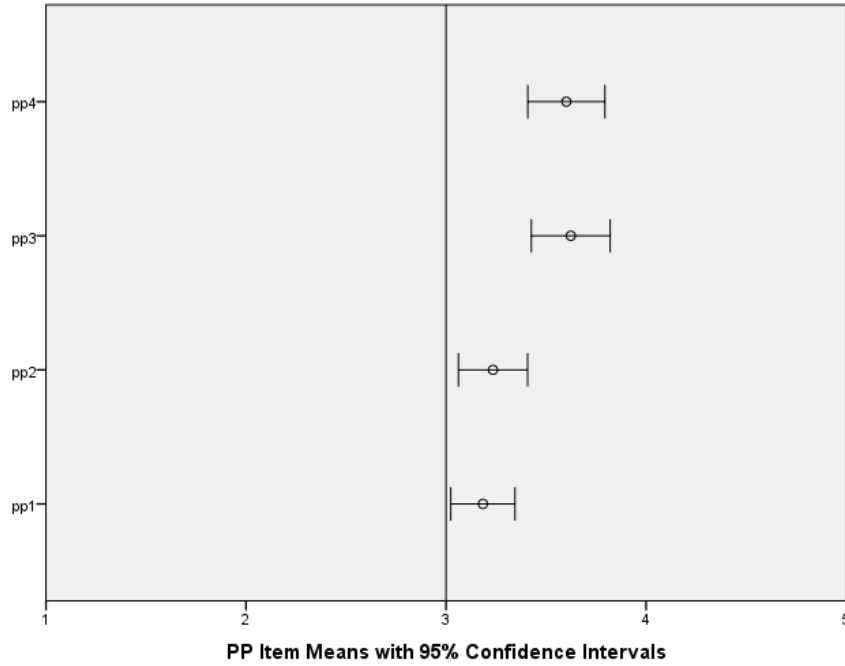
The next two latent variables are assessed to calculate a composite scale measuring the factor named 'Academic Efficiency'. They are Perceived Performance (PP) and Perceived Effort (PE).

#### Perceived Performance (PP)

The concept of Perceived Performance is assessed in this investigation as a latent variable indicated by four separate items. The four items correspond to Questions 30, 31, 32, and 33 in the VET entrant student survey (Appendix 1). Responses for all four items are available for 136 of the 140 survey respondents. The construct validity of the four-item Perceived Performance construct is discussed in Chapter 5, Section 5.5. Figure 6.48 and Figure 6.47, give a visual summary of how the respondents answer the four Perceived Performance items.



**Figure 6.47 VET entrant survey sample, PP item response distributions.**

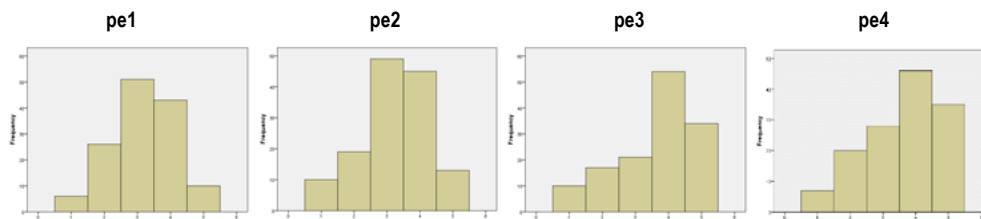


**Figure 6.48 VET entrant survey sample, PP item response means and confidence intervals.**

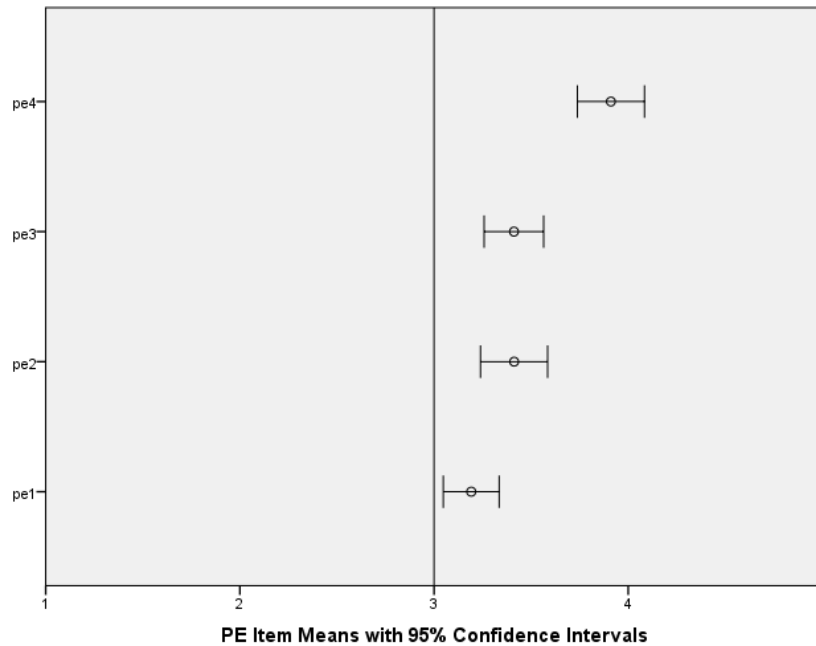
The set of histograms in Figure 6.47 and the error bar diagram shown in Figure 6.48, record how the respondents answer the four Perceived Performance items. The figures show that respondents tend to choose the ‘agree’ end of the scale for all four items. This indicates that most VET entrants record themselves as having a positive feeling towards their achieved grades. It is important to recognize that ‘perceived’ performance is used rather than the actual performance. This is done purposely, as it is the satisfaction in the grades that is important for the Academic Efficiency measure. A student may achieve a Pass grade and be highly satisfied with this, while another student may achieve a Credit grade but not be as satisfied, as they expect a higher Distinction grade. It is the feeling of satisfaction, which is important for the purposes of the Academic Efficiency composite scale.

#### Perceived Effort (PE)

The concept of Perceived Effort is assessed in this investigation as a latent variable indicated by four separate items. The four items correspond to Questions 34, 35, 36, and 37 in the VET entrant student survey (Appendix 1). Responses for all four items are available for 136 of the 140 survey respondents. The construct validity of the four-item Perceived Effort construct is discussed in Chapter 5, Section 5.6. Figure 6.50 and Figure 6.49, below, give a visual summary of how the respondents answer the four Perceived Effort items.



**Figure 6.49 VET entrant survey sample, PE item response distributions.**



**Figure 6.50 VET entrant survey sample, PE item response means and confidence intervals.**

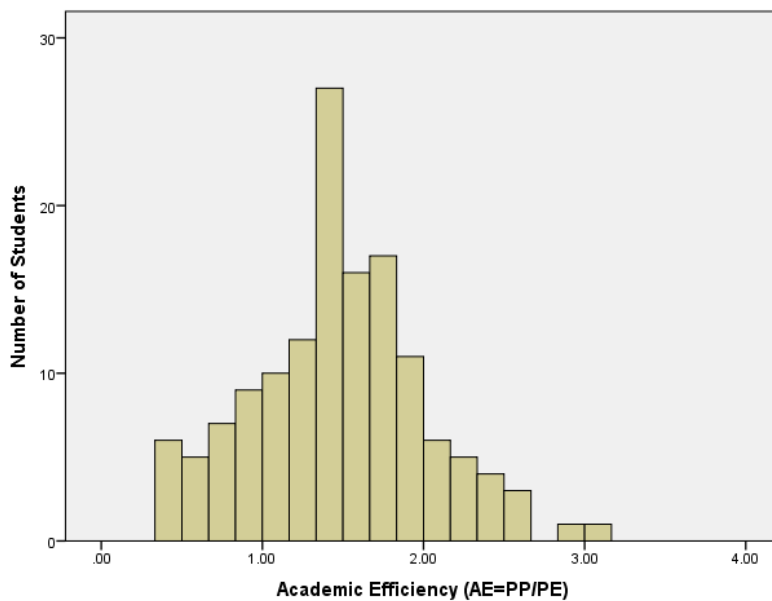
The set of histograms in Figure 6.49 and the error bar diagram shown in Figure 6.50, record how the respondents answer the four PE items. The diagrams show that respondents tend to choose the 'agree' end of the scale for all four items. This indicates that most survey sample students record themselves as putting more time and effort into their studies than they expected. Item pe4 is recorded as having the highest mean, and pe1 as the lowest mean. The wording in these two items suggest that effort rather than in-class contact time is the issue.

#### Academic Efficiency (AE)

The composite construct named Academic Efficiency (AE) is calculated from the Perceived Performance (PP) and Perceived Effort (PE) scales according to the following equation:

$$\text{Academic Efficiency (AE)} = \text{PP} / \text{PE}$$

The Academic Efficiency value for each student is calculated as Perceived Performance divided by Perceived Effort. To calculate values for Perceived Performance for each student, the factor score weights for each of the four Perceived Performance items above the factor loading of 0.30 are multiplied by the corresponding item correlation coefficients (see DiStefano, Zhu and Mindrila 2009). The four resultant products (one for each item) are then added together to produce an overall Perceived Performance value for each student. Factor score weights and correlation coefficients are obtained from AMOS outputs during the Confirmatory Factor Analyses. The same procedure is followed to calculate an overall Perceived Effort for each student, this time using the four items used to measure this construct. Finally, the overall Perceived Performance value is divided by the overall Perceived Effort value for each student to obtain an Academic Efficiency value for each student.



**Figure 6.51 VET entrant students academic efficiencies (AE).**

Academic Efficiency values are thus available for the 136 of 140 VET entrant students who respond to the Perceived Performance and Perceived Effort sections of the VET entrant survey. Figure 6.51 presents a visual summary of the range and frequency of the Academic Efficiency values for the VET entrant survey respondents

The values represented in Figure 6.51 are the calculated Academic Efficiency values for the 136 of 140 VET entrant survey respondents. This variable is considered as a continuous variable in the analyses described in later chapters. The mean value for Academic Efficiency is 1.48 with a standard deviation value of 0.54. Academic Efficiency, calculated in this manner, gives a measure of how efficiently the students study. Interpreting the mean value, the meaning is that a value of PP/PE is 1.48. This value represents the average amount of (perceived) performance achieved for one unit of (perceived) effort. Thus a student with an Academic Efficiency value below the mean indicates that that student achieved a lower than average (perceived) performance for the same unit of (perceived) effort. A student with an Academic Efficiency value above the mean indicates that that student achieved a higher than average (perceived) performance for the unit of effort. Thus, students with higher Academic Efficiency values are more efficient in obtaining a performance that they are satisfied with, than students with lower Academic Efficiency values.

#### 6.2.3.4 *Student Peer Outcomes*

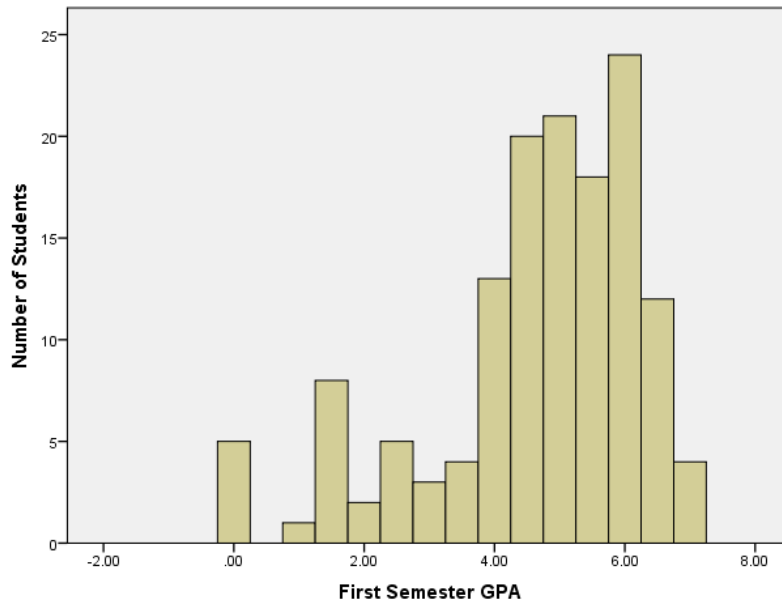
Two 'student outcome' variables are investigated in this study: First Semester GPA (GPA); and Student Drop Out (DO).

##### First Semester GPA (GPA)

Values for this variable are available for all 140 survey respondents. The values for this variable are extracted from university records. The extracted values are the Grade Point Averages achieved in the first semester of enrolment by the students in the survey sample. The range in GPA values is shown in Figure 6.52.

The histogram, presented in Figure 6.52, records the survey respondents as having a first semester GPA of between 0.00 and 7.00. This variable is considered to be continuous in the analyses described in later chapters. The mean GPA value for this group of students is 4.59 with a standard deviation value of 1.65. This mean GPA value is higher than an overall pass. A 'Pass' grade is considered as 4.00 at the university. If a student achieves 'High Distinctions' for all their first semester grades, he or she is recorded as achieving a GPA of 7.0. The histogram records that the majority of students (109 of 140) obtained a Pass average (GPA=4.0) or better. Three students achieved a maximum GPA value of 7.00. At the opposite end of the GPA scale, five

students recorded a GPA value of 0.00. Overall, the VET entrant survey respondent sample appear to be a high achieving group of students.



**Figure 6.52 VET entrant students first semester GPAs (GPA).**

#### Drop Out (DO)

This variable is assessed as a dichotomous variable. Students are assessed as either having dropped out or persisted to their second year of studies. Each student's status is checked one year after their first enrolment on university records. This is done for all 140 students in the study. For the histogram and values for this variable, see the comparison between the population and survey sample in Section 6.1.

It is noted that several continuous variables described in this section display skewness, which would distort results obtained from parametric statistical analyses. Multivariate procedures involving grouped data, such as those used in this current investigation and described in the following chapters, however, assume an underlying multivariate normality. This can be only partially checked by observing whether the individual variables involved are themselves normally distributed. Multivariate normality is not readily tested as available tests are overly sensitive. However, with sufficiently large sample sizes, the Central Limit Theorem suggests that multivariate normality, can be safely assumed regardless of the distributions of the individual variables (Tabachnick & Fidell 2007 p.78).

## 6.3 Descriptive statistics summary

### Summary

This chapter describes the variables involved in this investigation. It is divided into the faculty level, program level and student level variables. In this study, the variables are considered as either continuous or categorical in nature. In general categorical variables with an ordinal nature have been treated as continuous in the analyses described in later chapters. These include student level: SES, VET Qualification, Program Preference, and University Preference. The remaining categorical variables have a binary nature and are treated as dichotomous variables in the analyses both in this section and in the analyses described in later chapters. The variables at the three levels are summarized in Table 6.3, Table 6.4 and Table 6.5.

**Table 6.3 Descriptive Statistics Summary of Faculty Level Variables**

Faculty Level Variables	Number of Faculty Year Cohorts	Mean	Std. Deviation
Faculty Domestic Student Head Count (F_DSHC)	40	1570.55	402.23
Faculty Low SES Proportion (F_SES)	40	15.03	2.12
Faculty Gender Proportion (F_GGEN)	40	51.35	12.81
Faculty Peer Group Size (F_PGS)	40	23.73	21.88
Faculty GPA Average (F_GPA)	40	4.78	0.15
Faculty Retention Rate (F_ARR)	40	0.81	0.05

**Table 6.4 Descriptive Statistics Summary of Program Level Variables**

Program Level variables	Number of Program Year Cohorts	Mean	Std. Deviation
Program Domestic Student Head Count (P_DSHC)	54	223.04	183.64
Program Low SES Proportion (P_SES)	54	16.61	6.83
Program Male Proportion (P_GEN)	54	48.08	18.78
Program High School Rank Cut Off (P_HSRCO)	54	70.20	5.01
Program Peer Group Size (PGS)	54	7.67	8.36
Program GPA Average (P_GPA)	54	4.50	0.38
Program Retention Rate (P_ARR)	54	0.77	0.08

**Table 6.5 Descriptive Statistics Summary of Student Level Variables**

Student Level Variables	N	% of Cell	Mean	Std. Deviation
Student High School Rank (HSR)	60		33.74	14.39
Special Tertiary Admissions Test Rank (STATR)	44		67.73	14.75
VET Qualification level (VETQ)	140		2.56	1.07
Study gap (SG)	140		4.82	5.42
Student Home State (SO)	140			
SA	(136)	97.14%		.
Interstate	(4)	2.86%		
SES student (SES)	139		2.22	0.68
Gender (GEN)	140			
Male	(70)	50.00%		
Female	(70)	50.00%		
Age	140		32.24	10.21
Language Background (ESB)	140			
English Speaking	(127)	90.71%		
Non-English Speaking	(13)	9.29%		
Partnered Status (PS)	140			
Partnered	(42)	30.00%		
Non Partnered	(98)	70.00%		
Dependents (DEP)	140		0.61	1.23
Working Hours per Week (WHPW)	140		17.63	15.8
Financial Support (FS)	140			
Received Financial Support	(64)	45.71%		
No Support	(76)	54.29%		
Student Study Load (FTR)	140		0.35	0.14
Student Admit Semester (SEM)	140			
Semester 1	(109)	77.86%		
Semester 2	(31)	22.14%		
Program Preference (PROGP)	140		1.23	0.64
University Preference (UNIP)	140		1.07	0.31
Transfer Credit (TC)	140			
Received Transfer Credit	(52)	37.14%		
No Transfer credit	(88)	62.86%		
Peer Student Acquaintances (SN1)	136		3.49	3.85
Peer Student Close Friends (SN2)	136		1.15	1.47
Peer Student Academic Advisers (SN3)	136		1.51	1.51
Peer Student Social Advisers (SN4)	136		1.38	1.92
Academic Efficiency (AE)	140		1.48	0.54
First Semester GPA (GPA)	140		4.5	1.65
Drop Out (DO)	140			
Persisted	(114)	81.43%		
Dropped Out	(26)	18.57%		



## 7 Student Level Model and Mplus Results

Before presenting the results of the analyses employed in this investigation, it is important to recognize some methodological considerations regarding the development of path analytical techniques and the notions of causality.

The development of 'path analysis' has enabled researchers to move from verbal statements describing complex sets of causal interrelationships between variables to more precise mathematical statements represented in diagrammatic form (Tuijnman & Keeves, 1997). Many studies employing path analytic techniques and involving both direct and indirect paths of influence, on the student attrition outcomes, are presented and discussed in Chapter 2. In experimental scientific research, careful control of variables that might, directly or indirectly, influence an outcome of interest amongst randomized subjects allows inferences to be made regarding causal relationships between an assessed hypothetical factor and its outcome. It is important to recognize that in educational research, experimental controls and participant randomization are rarely possible. In this investigation, also, participants could not be randomized and explanatory variables could not be experimentally controlled. Thus, the explanatory variables assessed in this investigation are statistically controlled following the hypothesizing of a research model.

The notion of causality is intrinsically tied to the research model and its assessment. At least three conditions must be met if causal relationships can be inferred (see Darmawan, 2003).

1. A hypothesized factor must precede its hypothesized outcome,
2. The two must be shown to co-vary,
3. No other alternative explanations account for the covariance of the two.

With regards to the first two conditions, the research model, in this investigation, is longitudinal in nature, constructed on theoretical premises, and specifying causal relationships with the use of unidirectional arrows in the path diagram. Eliminating relationships, which are impossible or implausible in a probabilistic assessment of the model addresses the third condition. As Darmawan states:

If models were to be constructed of deterministic relations in terms of those relations that are known to exist, the model might be seriously deficient; that is more important probabilistic processes might be ignored and thus give rise to spurious conclusions.

Instead models are developed by eliminating the relations that are not statistically significant when assessed in probabilistic terms. (Darmawan, 2003, p. 71)

In this study, the Mplus computer program is employed to investigate university student drop out and this chapter presents the modelling of the student level variables and the results obtained. The chapter is divided into three parts. The first part presents and discusses the base line model, and is based on the student level variables previously presented in the Research Model shown in Figure 3.1. The second part of the chapter presents the final model resulting from the modelling approach and the model generating strategy that is discussed in Chapter 4, and showing the best model solution for the variables tested. Results of the Mplus analyses are reported within this section. Finally, the significant paths within the model are briefly discussed within the third section of this chapter.

In order to aid the description of the variables involved in the path model resulting from the Mplus analyses, two more terms for the variables are required. Within a path model, such as that introduced in Figure 7.1 in this chapter, the variables can be divided into 'exogenous' and 'endogenous' variables. Exogenous variables are those that are hypothesized to 'cause' fluctuations in the values of other variables in a path model. The changes within the exogenous variables are not explained within the model they are in. Exogenous is, thus, synonymous with independent. Conversely, endogenous variables are influenced by the exogenous variables in a path model either directly or indirectly and as such can be seen to be synonymous with dependent variables.

## **7.1 Base line model**

In this study, 140 VET entrants responded to the survey out of a total population of 511 students. The students had entered the university between 2005 and 2012. The survey provides the investigation with primary data, particularly with respect to a number of latent variables. Secondary data for the 140 survey respondents, extracted from the university and state admission centre records, are added to the list of available variables used in the modelling process. All student level variables obtained originate from the student level and there is no disaggregation of higher-level data. The base line model therefore contains a mixture of primary and secondary data and numerous latent and observed variables. Due also to the exploratory nature of this investigation and with the inclusion of previously undescribed variables, such as

Academic Efficiency and the various Student Network Sizes, paths hypothesized to be of influence are drawn so as to test all possible relationships between the variables.

Table 7.1 records the 28 variables included at the student level in the student level analysis and how they are coded. The variable type, or nature of the variable, is given as either continuous or binary, to specify how the variable is coded for examination by the Mplus computer program. The binary variable is further interpreted as ordered and categorical.

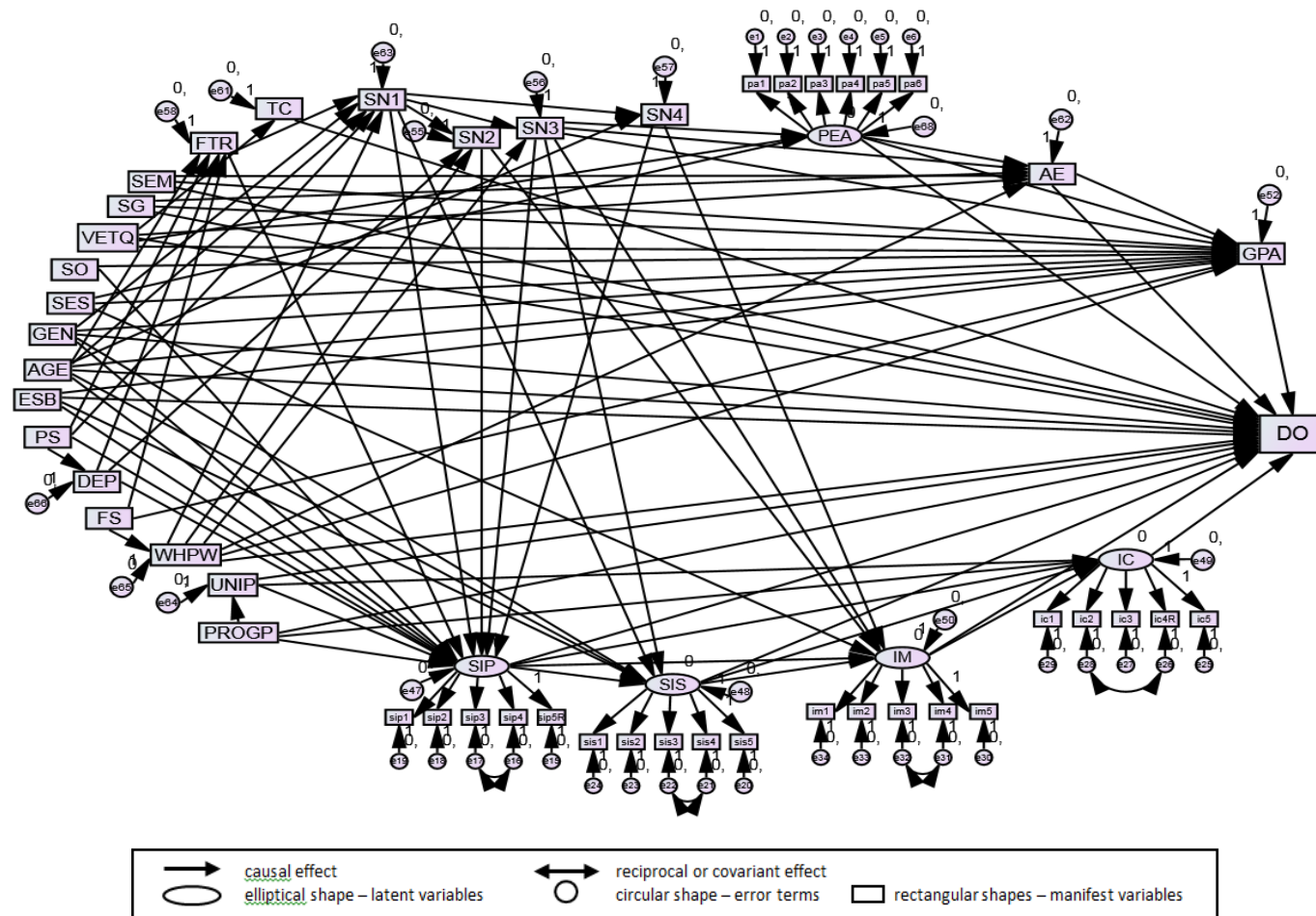
**Table 7.1 Variables Examined at the Student Level of Analysis**

Acronym	Description	Coding - Score	Variable Type
HSR	Student High School Rank	Ranking score (0 - 99.95)	Continuous
STATR	Special Tertiary Admissions Test Rank	Ranking score (0 - 99.95)	Continuous
VETQ	VET Qualification Level	CertIV(1), AdCert(2), Dip(3), AdDip(4), GradDip(5)	Continuous
SG	Study Gap	Years since completing VETQ	Continuous
SO	Student Home State	South Australia (0), Interstate (1)	Binary
SES	Socio Economic Status	Low SES (1), Medium SES (2), High SES (3)	Continuous
GEN	Gender	Male (0), Female (1)	Continuous
AGE	Age	Years of age	Continuous
ESB	Language Background	Non-English (0), English (1)	Binary
PS	Partnered Status	Non-Partnered (0), Partnered (1)	Dichotomous
DEP	Dependents	Number of dependents	Continuous
WHPW	Working Hours per Week	Number of hours	Continuous
FS	Financial Support	No Support (0), Received Support (1)	Binary
FTR	Student Study Load	Semester Load (score range 0-0.50)	Continuous
SEM	Student Admit Semester	Semester 1 (1), Semester 2 (2)	Dichotomous
PROGP	Program Preference	Preference Score (1, 2, 3, 4, 5)	Continuous
UNIP	University Preference	Preference Score (1, 2, 3, 4, 5)	Continuous
TC	Transfer Credit	No Credit (0), Received Credit (1)	Binary
SN1	Peer Student Acquaintances	Number of peer students	Continuous
SN2	Peer Student Close Friends	Number of peer students	Continuous
SN3	Peer Student Academic Advisers	Number of peer students	Continuous
SN4	Peer Student Social Advisers	Number of peer students	Continuous
SIP	Social Integration with Peers (5 items)	Each item using Likert Scale (1-5)	Continuous
SIS	Social Integration with Staff (5 items)	Each item using Likert Scale (1-5)	Continuous
IC	Institutional Commitment (5 items)	Each item using Likert Scale (1-5)	Continuous
IM	Institutional Membership (5 items)	Each item using Likert Scale (1-5)	Continuous
PEA	Perceived Educational Ability (5 items)	Each item using Likert Scale (1-5)	Continuous
AE	Academic Efficiency	Composite Construct (score range 0.00-3.00)	Continuous
GPA	First Semester Grade Point Average	GPA (score range 0.00-7.00)	Continuous
DO	Drop Out	Persisted (0), Dropped Out (1)	Binary

Table 7.1 records that most of the variables assessed at the student level are of a continuous nature. However, the final outcome variable is of a binary nature. This feature makes the use of the Mplus computer program particularly appropriate, as it can examine a binary or dichotomous outcome variable. AMOS, the SEM software program used for the factor analyses, is trialled but proves difficult to use when the Drop Out variable is identified as a binary variable.

The base line model, shown in Figure 7.1, has a single final outcome endogenous variable, student Drop Out, as well as 16 other endogenous variables and 11 exogenous variables. Both direct and indirect influences are tested simultaneously using the Mplus software program. Five of the variables are latent and the other 23 variables are observed variables. The Mplus program estimates paths both of continuous and categorical variables in its analyses. Exogenous variables can be continuous or binary in nature. Endogenous categorical variables are specified in the Mplus input commands. The final outcome endogenous variable Drop Out and one other endogenous variable, Transfer Credit, are identified as binary and ordered categorical factors in the baseline model shown in Figure 7.1. Three other exogenous categorical variables, Student Home State, Language Background and Financial Support are also included in the analysis.

Figure 7.1 presents the base line model tested using the Mplus, version 7, computer program. The base line model shows that the modelling procedure tests numerous direct and indirect paths of influence between the variables and Figure 7.1 shows the specified path diagram with all the variables tested in this investigation. The structural equation model portrayed has several different symbols to represent the different calculations that the Mplus program computes when examining the model. Observed or manifest variables are shown using straight lined square or rectangular boxes, and unobserved or latent variables are shown using elliptical shapes. Hypothesized lines of causal influence (regression lines) are depicted as single-headed arrows with the direction of influence shown by the direction of the arrow. Double-headed arrows indicate covariance or reciprocal relationships. Associated with each observed variable involving a latent variable in the model are error terms, shown in circles. These errors represent systematic errors. Errors are also assessed for each dependent variable being hypothesized and included in the model. These errors are calculated from residual variances in the structural (regression) equations and they represent the error estimated during the analyses of endogenous variables from exogenous variables. These residual terms are also represented by circles and are associated with all the endogenous variables in the model.



**Figure 7.1 Student level base line model**

Refer to Table 7.1 on page 219 for the description of the variables assessed in the base line model.

## 7.2 Final model

Following the modelling approach and the model generating strategy the final model is estimated from the available data. In order to estimate the parameters of the final model the Mplus default estimator is used. For a categorical outcome variable, the mean and variance-adjusted weighted least square based (WLSMV) estimator is the default estimator in the Mplus version 7 computer program (Muthen and Muthen, 1998–2010). The link function for this estimator is the 'probit' link by default. Wang and Wang (2012) described this estimator as robust for these conditions. This estimator assesses variance within the model, produces estimated values for the model's path coefficients and the estimated percentage variance explained by the model for each of the explanatory factors, with Drop Out operating as the final outcome. R square estimates obtained from the probit analyses need to be interpreted with caution. The R square values reported in some of the past studies on university attrition that are reviewed in Chapter 2, and that provide a background for this investigation, have generally resulted from analyses based on Ordinary Least Squares (OLS) regression. Comparisons between the R square estimates obtained from these two analytical procedures thus need to be discussed with caution.

In order to judge how well the final model fits the data, various 'goodness-of-fit' indicators are generated by the Mplus, version 7, computer program. As is discussed in Chapter 5 for the Confirmatory Factor Analyses of the latent variables, no single model –fit indicator can provide consistent and useful assessments in all situations. Thus groups of indices are used to assess the final model generated using the Mplus computer program. Chi square is reported together with the 'chi square value relative to the degrees of freedom' (CMIN/df) that takes into consideration the sample size. Generally, the lower the values for these two indices the better the estimated fit. However, these values are not comparable to other studies as the chi square in this case is not used for chi square difference between models. Values are also calculated for the Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI). As is explained in the confirmatory factor analysis the TLI and CFI usually range between 0 and 1.0 and indicate a good fit with values higher than 0.90, and ideally close to 0.95. Also reported is the Root Mean Square Error of Approximation (RMSEA), which assesses the discrepancy between the model and the population by taking into account the error of approximation (see Byrne, 2012). The optimal values for RMSEA are 0.05 or below, with values greater than 0.10 indicative of poor fit. The analysis of the final structural model, presented in Figure 7.2, while not recording a completely satisfactory

degree of model fit as indicated by two of the model-fit indices, can be considered as having the best fit for the VET entrant data. The final model is the most structurally sound model that can be generated from the available data, which maximises the number of significant explanatory variables and the level of 'goodness of fit' as indicated by the various measures described above. As Byrne (Byrne, 2012, p. 163) described 'final models in SEM should represent the best fitting, albeit most parsimonious, model of any set of tested models'. The final model, shown in Figure 7.2, results in 18 variables having significant direct or indirect influences on student Drop Out. These are: Age, VET Qualification Level, Financial Support, Working Hours Per Week, Semester, Study Load, University Preference, Transfer Credit, Peer Student Acquaintances, Peer Student Close Friends, Peer Student Academic Advisers, Peer Student Social Advisers, Social Integration with Peers, Social Integration with Staff, Institutional Membership, Institutional Commitment, Academic Efficiency, and Grade Point Average.

Nine variables, from the original base line model, are found to have no significant direct or indirect influence on drop out or produce a poor-fitting solution during the model-generating phase, and are excluded from the final model. These are: Partnered Status, Dependents, Gender, Socio-Economic Status, Language Background, State of Origin, Study Gap, Program Preference, and Perceived Educational Ability.

Key components of the Mplus analysis output are presented in three tables. Table 7.2 records the goodness-of-fit results, Table 7.3 records the parameter estimates and Table 7.4 records the R square values estimated for the final model.

**Table 7.2 Mplus Output: Final Structural Model Goodness of Fit Statistics**

N=136		Tests of Model Fit	
Chi Square Test of Model Fit			
Value			630.12*
Degrees of freedom			537
p-value			0.00
CMIN/df			1.17
Comparative Fit and Tucker-Lewis Indices			
Comparative Fit Index (CFI)			0.87
Tucker-Lewis Index (TLI)			0.86
Root Mean Square Error Of Approximation (RMSEA) Estimate			0.04

\* The chi square value for WLSMV cannot be used in the regular way. Difference testing is done using the DIFFEST option.

It is recorded in Table 7.2, that the estimation of the final structural model yields an overall chi square value of 630.12 with 537 degrees of freedom. Thus, 'chi square relative to the degrees of freedom' results in the value of 1.17. The Comparative Fit Index (CFI) value of 0.87 and the Tucker-Lewis Fit index (TLI) value of 0.86 indicate that this final structural model is close to, but not entirely, satisfactory in terms of model fit. However, this final model must be considered to provide the best fit of the tested set of models to the data. In addition, the Mplus analysis provides a value for the Root Mean Square Error of Approximation (RMSEA) of 0.04, which is below the desired level of 0.05. The value for RMSEA is considered by some researchers as the most informative index (see Torres 2006) and is thus indicative of good fit.

Table 7.3 records the parameter estimates of the final model. The Mplus output is used in the table. The term 'BY' refers to a latent variable indicated 'by' an observed variable, or survey item in this case. The term 'WITH' refers to when two variables co-vary 'with' each other. The term 'ON' refers to when an independent variable has an influence 'on' a dependent variable. Of note, for variables ic1, im1, sis1 and sip1, when loading onto their respective latent variables, all have an unstandardized estimate value of 1.00 with a standard error value of 0.00 and a ' $b/SE$ ' (or ' $t$ ') and ' $\beta$ ' value of 999.00. These values are fixed, by the Mplus computer program, for the purposes of identification and are therefore not freely estimated.

Of note, and not shown in the tables is that the analysis is based on 136 observations, rather than 140. Mplus disregards the four cases where there are missing data. Despite this relatively small sample size, the analysis is able to yield many significant causal paths. One of the paths is significant at the 10 per cent level, namely that Age influences Student Study Load. All other estimated influences are more highly significant, to the five per cent level or less.



**Table 7.3 Mplus Output: Final Structure Model Parameter Estimates**

Model Results (N=136)		<i>b</i>	<i>SE</i>	<i>b/SE</i>	$\beta$	$\rho$
IC BY	ic1	1.00	0.00	999.00	0.58	999.00
	ic2	1.11	0.24	4.70	0.53***	0.00
	ic3	1.51	0.24	6.38	0.84***	0.00
	ic4	0.77	0.19	4.08	0.42***	0.00
	ic5	0.92	0.22	4.15	0.59***	0.00
ic2 WITH	ic4	0.29	0.10	3.07	0.29***	0.00
IM BY	im1	1.00	0.00	999.00	0.92	999.00
	im2	0.91	0.09	9.93	0.88***	0.00
	im3	1.01	0.12	8.70	0.92***	0.00
	im4	0.92	0.16	5.95	0.75***	0.00
	im5	0.63	0.10	6.61	0.63***	0.00
SIS BY	sis1	1.00	0.00	999.00	0.73	999.00
	sis2	0.99	0.13	7.73	0.73***	0.00
	sis3	1.24	0.19	6.44	0.93***	0.00
	sis4	0.97	0.20	4.93	0.77***	0.00
	sis5	1.08	0.28	3.80	0.67***	0.00
SIP BY	sip1	1.00	0.00	999.00	0.92	999.00
	sip2	0.94	0.14	6.90	0.80***	0.00
	sip3	1.02	0.12	8.31	0.89***	0.00
	sip4	0.91	0.12	7.63	0.84***	0.00
	sip5	0.50	0.13	3.79	0.43***	0.00
SN3 ON	SN1	0.10	0.02	4.46	0.27***	0.00
SN2 ON	SN1	0.17	0.04	4.67	0.47***	0.00
FTR ON	AGE	-0.01	0.01	-1.76	-0.75*	0.08
	FS	0.10	0.03	3.54	0.27***	0.00
WHPW ON	FS	-18.18	2.99	-6.09	-0.58***	0.00
TC ON	VETQ	0.30	0.12	2.49	0.30***	0.01
SN4 ON	SN2	0.77	0.11	7.11	0.60***	0.00
SIP ON	FTR	1.72	0.73	2.36	0.27**	0.02
	SN2	0.19	0.08	2.25	0.23**	0.02
	SN4	0.21	0.07	3.01	0.33***	0.00
	UNIP	0.98	0.51	1.94	0.26**	0.05
SIS ON	SIP	0.32	0.08	4.05	0.44***	0.00
IM ON	SIP	0.29	0.08	3.75	0.33***	0.00
	SIS	0.43	0.12	3.76	0.36***	0.00
IC ON	IM	0.41	0.09	4.70	0.71***	0.00
AE ON	WHPW	0.01	0.00	2.41	0.19**	0.02
GPA ON	AE	1.28	0.17	7.58	0.44***	0.00
	SEM	-0.71	0.33	-2.16	-0.19**	0.03
	SN3	0.25	0.11	2.37	0.24**	0.02
DO ON	GPA	-0.28	0.06	-4.65	-0.42***	0.00
	TC	-0.40	0.16	-2.55	-0.42***	0.01
	IC	-1.24	0.26	-4.77	-0.71***	0.00

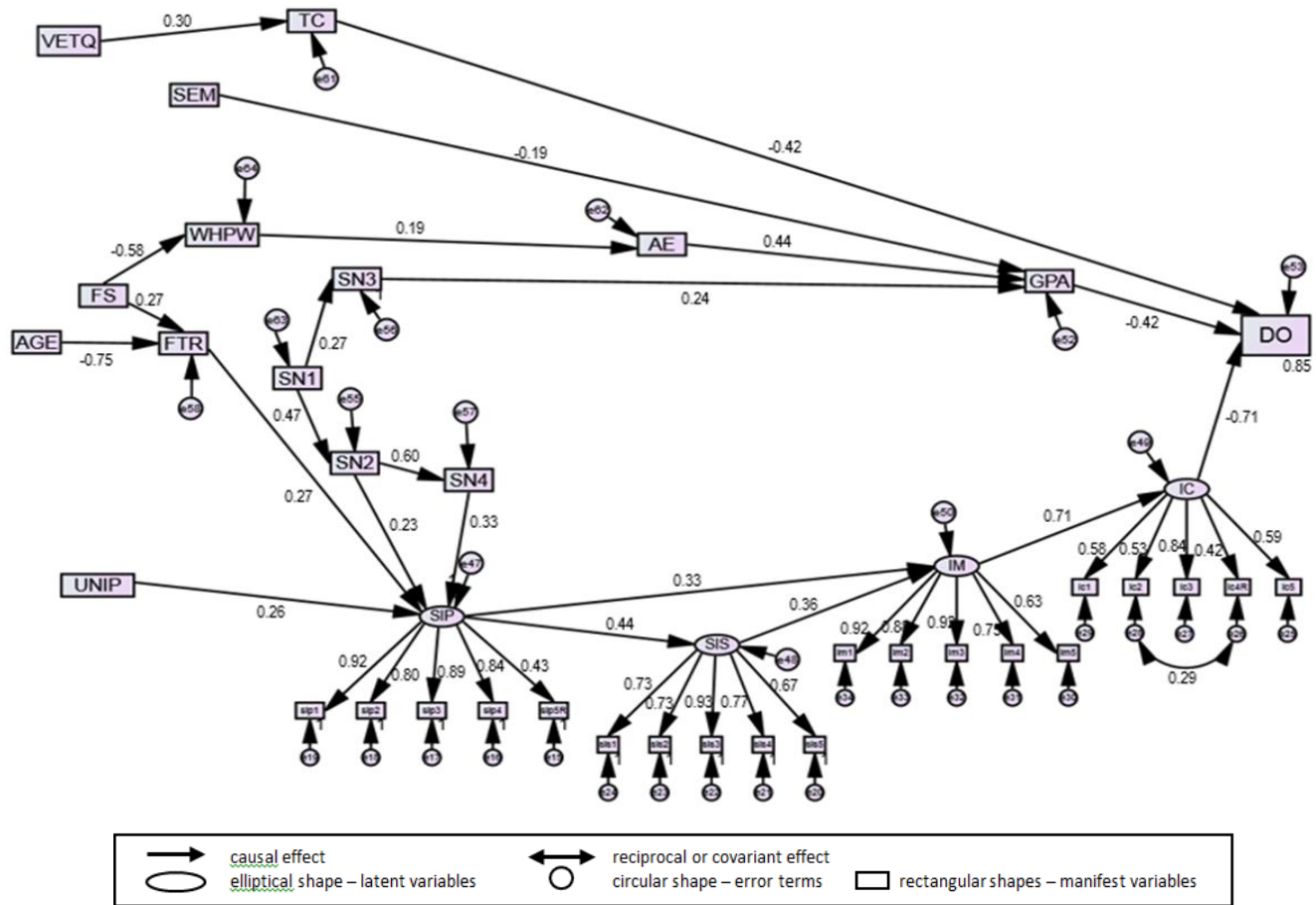
\*significant at the 10% ( $p < 0.10$ )      \*\*significant at the 5% level ( $p \leq 0.05$ )      \*\*\*significant at the 1% level ( $\leq 0.01$ )  
*b* = Unstandardized Estimate      *SE* = Standard Error       $\beta$  = Standardized Estimate       $\rho$  = Two-Tailed p-Value

Table 7.4 records the R square estimates for the dependent variables in the Final Model. The values computed by the Mplus computer program, and shown in the table, indicate that relatively large R square values are estimated for many of the variables in the final model.

**Table 7.4 Mplus Output: Final Structural Model R Square Estimates**

N=136		R Square Estimate
Observed Variable	Study Load (FTR)	0.63
	Transfer Credit (TC)	0.09
	Working Hours Per Week (WHPW)	0.34
	Peer Student Close Friends (SN2)	0.23
	Peer Student Academic Advisers (SN3)	0.07
	Peer Student Social Advisers (SN4)	0.36
	Academic Efficiency (AE)	0.04
	First Semester Grade Point Average (GPA)	0.29
	Latent Variable	Social Integration with Peers (SIP)
Social Integration with Staff (SIS)		0.20
Institutional Membership (IM)		0.35
Institutional Commitment (IC)		0.50
Outcome Variable	Drop Out (DO)	0.85

Over half of the variance (63%) is explained for the Student Study Load (FTR). Approximately half (or 50%) of the variance is explained by the model of the Institutional Commitment (IC) latent variable. Most notably, the analysis estimates an R square value of 0.85 for the Drop Out (DO), the outcome variable and major focus of this analysis. This indicates that the final model explains 85 per cent of the possible variance in the Drop Out decision made by the VET entrants. This estimate is higher than any of the variances explained by models tested in the previous studies reviewed in Chapter 2. Possible reasons, for this relatively high value of R square, are addressed in the discussion in Chapter 10. The R square value for the outcome of Drop Out is also recorded in the path diagram of the Final Model, shown in Figure 7.2. The figure records all the significant direct and indirect paths of influence leading to the outcome variable of Drop Out. The paths are shown with the associated path coefficients, indicating the strength of the estimated influences for each of the paths. Values are also recorded for the item path coefficients for the four latent variables included in the final model.



**Figure 7.2 Student level final model.**

Refer to Table 7.1 on page 219 and Table 7.3 on page 225 for the description of the variables represented in the final model.

### 7.3 Significant direct and indirect paths in the final model

The outcome variable for the path model is Drop Out (DO). There are both direct and indirect effects on the Drop Out variable. Figure 7.2 records that there are three significant paths from three direct explanatory variables, Transfer Credit (TC), Grade Point Average (GPA) and Institutional Commitment (IC). It is noteworthy that all three final paths leading directly to the Drop Out (DO) have negative coefficient values (TC:  $\beta = -0.42$ ,  $p = 0.01$ ; GPA:  $\beta = -0.42$ ,  $p = 0.00$ ; IC:  $\beta = -0.071$ ,  $p = 0.00$ ). They indicate that as the values of the explanatory variables rise there is the probability that students do not drop out, since the Drop Out (DO) value 'changes' from 1 (dropping out) to 0 (persisting). Thus, if students receive Transfer Credit, or if their grades improve and their GPA rises, or if they are more committed to the university, then they are more likely to persist and continue to their second year of studies.

The significant paths in the final model can be divided visually into two groups. This split relates to a conceptual division between constructs which relate to both the logical and emotional sides of the decision making process. In Chapter 10, these concepts are discussed in greater detail in the framing of a newly developed conceptual framework for the students making of a Drop Out decision. In the top half of the diagram of the path model, the paths of influence lead to the outcome of Drop Out through the Transfer Credit (TC) and the Grade Point Average (GPA) variables. In the bottom half of the path model, the paths of influence lead to the outcome through the latent Institutional Commitment (IC) variable.

In the variables shown in the top half of the final model, two distinct sets of causal paths are evident. In the first set, students' VET Qualification (VETQ) influences Transfer Credit (TC) ( $\beta = 0.30$ ,  $p = 0.01$ ). Transfer Credit (TC), in turn, leads to a lower level of Drop Out ( $\beta = -0.42$ ,  $p = 0.01$ ). Thus, a student entering with a higher VET qualification is more likely to receive credit, and this credit makes the student less likely to drop out.

In the second set, three causal paths are connected to Grade Point Average (GPA), which in turn has a direct influence on the outcome variable. The first causal path, in this section of the model, leads from whether students begin their university studies in the first or second semesters. There

is a significant causal link between Student Admit Semester (SEM) and Grade Point Average (GPA) ( $\beta = -0.19, p = 0.03$ ). The negative path coefficient indicates that students entering in Semester 2 tend to obtain a lower Grade Point average (GPA) than students who enter in Semester 1.

In the second causal path, Financial Support (FS) significantly influences Working Hours Per Week (WHPW) ( $\beta = -0.58, p = 0.00$ ) of employment. The negative path coefficient indicates that if students don't receive any Financial Support (FS), they tend to work more hours (WHPW) for income purposes to support themselves financially through their first year of studies. The students' Working Hours Per Week (WHPW) significantly influences students' Academic Efficiency (AE) ( $\beta = 0.19, p = 0.02$ ). This causal path indicates that if a student has a higher amount of Working Hours Per Week of employment, this then causes the students to have a higher Academic Efficiency (AE) value. Consequently, as the students work more hours in a job to support themselves financially, they become, or possibly are forced to become, more efficient in their first year studies at the university. This Academic Efficiency then significantly influences Grade Point Average (GPA) ( $\beta = 0.44, p = 0.00$ ), which in turn has a direct influence on Drop Out (DO). Thus as the students become more efficient with their studies their grades improve, and then they are less likely to drop out.

A third causal path commences with the number of Peer Student Acquaintances (SN1) that the VET entrants have. There is a significant causal path from Peer Student Acquaintances (SN1) to Peer Student Academic Advisers (SN3) ( $\beta = 0.27, p = 0.00$ ). Then there is a significant causal path from Peer Student Academic Advisers (SN3) to Grade Point Average (GPA) ( $\beta = 0.24, p = 0.02$ ). This third path of influence through academic performance suggests that a higher number of acquaintances leads to a higher number of Peer Student Academic Advisers. This higher number of peer student academic advisers leads to a higher GPA value. Consequently, if students have more acquaintances, they are more likely to have peer students giving them academic advice. The students are then more likely to receive better grades if they have more peers giving them academic advice.

Path analysis allows for estimations of both direct and indirect effects on the outcome variable. With regards to indirect effects, effect sizes are generally said to be of practical significance if they are greater or equal to a value 0.10. As Tuijnman and Keeves (1997) noted, indirect effects

can be calculated from the path coefficients in the final model. Using this method to estimate the indirect effects, there are two explanatory variables, whose indirect effect influence Drop Out mediated through students' GPA's, that are important to this investigation and that have effects sizes that are large enough to be of practical significance. Academic Efficiency (AE) has an indirect effect ( $r=0.44*0.42=-0.18$ ) on Drop Out through students' Grade Point Average (GPA). Thus as students become efficient with their studies this then has positive indirect effect on their persistence through their GPA results. Similarly, Peer Student Academic Advisers (SN3) also have an indirect effect on Drop Out ( $r=0.24*0.42=-0.10$ ). Thus, as students receive academic advice from more of their peers this then has a positive indirect effect on their persistence through their GPA results.

Summarizing the effects on the drop out outcome through students' Grade Point Averages (GPA's), when the students' GPA's increase, as a result of studying more efficiently, beginning their studies in the first semester and having more peer student academic advisers, the students' attrition levels improve. Of note also is that the Mplus calculations for GPA's influence on the probability of the Drop Out outcome, switching from 1 to 0, is equivalent in strength ( $\beta = -0.42$ ) to the Transfer Credit's direct influence on the outcome. Thus, the magnitude of the effect on student attrition from Transfer Credit is the same as that for GPA.

In the bottom half of the final model, the causal paths influence the only direct explanatory variable in this bottom half, namely the students' Institutional Commitment (IC). Institutional Commitment's direct influence on the outcome of Drop Out ( $\beta = -0.71, p = 0.00$ ) is the strongest in magnitude of the three direct explanatory variables (TC, GPA and IC). The results of the analyses also indicate that Institutional Commitment is itself directly influenced by only one of the variables tested in the investigation. Institutional Membership (IM) has the only direct influence ( $\beta = 0.71, p = 0.00$ ) on Institutional Commitment in the Final Model. Thus, as students' feelings of belonging to the university rise, they then are more likely to be committed to the university.

In turn, Institutional Membership is itself directly influenced by the two social integration variables, Social Integration with Peers (SIP) ( $\beta = 0.33, p = 0.00$ ) and Social Integration with Staff (SIS) ( $\beta = 0.36, p = 0.00$ ). The Social Integration with Peers (SIP) total effect is enhanced by its estimated direct influence ( $\beta = 0.44, p = 0.00$ ) on Social Integration with Staff (SIS). Thus, as students social interactions with their peers improve, they also more likely to have better social interactions with

university staff. The improved interactions with both peers and university staff leads students to have stronger feelings of belonging or membership to the university.

A number of variables have influences on Social Integration with Peers (SIP). The number of Peer Student Close Friends (SN2) ( $\beta = 0.23, p = 0.02$ ) and Peer Student Personal Advisers (SN4) ( $\beta = 0.33, p = 0.00$ ) have a positive influence on the Social Integration with Peers (SIP). The model also indicates that these peer student friends are a result of the number of Peer Student Acquaintances (SN1) ( $\beta = 0.47, p = 0.00$ ). Thus, if students have a larger number of acquaintances, they are more likely to have a larger number of close friends and a larger number of peers giving them social advice. Students having these larger student networks are more likely to have positive social interactions with their peers.

Also influencing Social Integration with Peers is the Students' Study Load (FTR). As the Students' Study Load increases, the model indicates that their Social Integration with Peers increases ( $\beta = 0.27, p = 0.02$ ). The Student Study Load is itself influenced by whether students receive Financial Support (FS) and by the Age (AGE) of the students. The model indicates that a higher Student Study Load (FTR) value is influenced by a lower Age (AGE) ( $\beta = -0.75, p = 0.08$ ) and whether the student receives some Financial Support (FS) in the first year of their studies ( $\beta = 0.27, p = 0.00$ ). Thus, younger students and those students receiving some financial support are more likely to have an increased study load at the university. This increased study load then has a positive influence on student interactions with their peers.

A further influence on Social Integration with Peers (SIP) is recorded for the students' University Preference (UNIP). If students had placed the university as their first preference in their state admission centre preferences, they tend to record a higher value of Social Integration with Peers ( $\beta = 0.26, p = 0.05$ ). Thus, students who wanted to be at the university are more likely to have better social interactions with their peers.

With regards to indirect effects in this bottom half of the final model, several explanatory variables have large enough indirect effects to be of practical significance. Institutional Membership has the largest indirect effect which operates through the mediating variable of Institutional Commitment ( $r = 0.71 * -0.71 = -0.50$ ). Of importance to this investigation Social Integration with Peers also has the second largest indirect effect, operating through the mediating variables of Social Integration

with Staff, Institutional Membership and Institutional Commitment ( $r=0.33*0.71*-0.71+0.44*0.36*0.71*-0.71=-0.25$ ). Thus, having strong feelings of membership and belonging to the university and socially integrating with peers have significant indirect positive influences on student persistence at the university.

In conclusion, the bottom half of the final model indicates that as the students spend more time on campus and as they make more acquaintances, and personal friends their level of social integration with peers increases. This then influences their relationships with staff and with their feelings of membership and belonging at the university. These feelings then influence their commitment to remain at the university. This commitment has a major direct influence on their decision to stay at the university. Similar to the other direct explanatory variables influencing Drop Out, the value of the path coefficient for Institutional Commitment is negative ( $\beta = -0.71$ ) and highly significant ( $p = 0.00$ ) indicating that Institutional Commitment value influences the probability of the Drop Out value switching from zero to one. This implies that as the Institutional Commitment value increases, the Drop Out value tends to go from one to zero.

## Summary

There are three direct explanatory variables of whether VET entrants decide to drop out in their first year of studies. If students underperform and receive a lower GPA score, if they don't receive credit for their past studies prior to entering university, and if they are not as committed to the university, then they are more likely to drop out at higher rates during their first year of studies. These direct explanatory variables are themselves influenced by other explanatory variables, which are shown in the final model in Figure 7.2. Several indirect effects on Drop Out are also evident. Institutional Membership has the largest indirect effect on Drop Out, doing so through Institutional Commitment. Of note to this investigation, Academic Efficiency and the number of Peer Student Academic Advisers have indirect effects, through students' GPAs, of practical significance. The final model is able to account for 85 per cent of variance explained for the dropping out of university for this group of students.



## 8 Multilevel Model and HLM Results

In the previous chapter, a structural equation model is generated to explain why Adelaide University VET entrants between 2005 and 2012 decided to either drop out or persist from the first to their second year of studies. The basis of the Final Model, shown in Figure 7.2, is that variables tested are at a single individual student level and are not independent of each other. Educational data is however, inherently nested. In secondary education, high school students study within classes and classes are within schools. Similarly in higher education, university students study within courses that are within programs. These programs are within faculties and faculties are within universities. If data analysis were to account for all variables simply at the single individual level, all students would assume to 'experience' what the variables are assessing in an independent manner. For example, if students are placed within a class (in this investigation a class has been defined as 'a program year cohort') that has a high attrition rate, and that a class' attrition rate is placed as a variable within an individual student level model, the students are assigned statistically to be influenced by the class attrition rate as if they experienced it independently of any of the other students in the same class. Conversely, multilevel techniques allow for students within study groups like classes or program year cohorts to be treated as more closely related to each other than to students who are attending other classes.

Consequently, in order to account for the nested nature of the data, students within a program year cohort can be aggregated together and the attrition rate for that particular 'program year cohort' can be hypothesized to influence individual student drop out within the nested group of students. Conversely, program level data can, on occasions, be disaggregated and each student can be given a value. However, this is not done for any of the variables in this study because of the bias that is involved through disaggregation. In this investigation, the 'VET entrant peer group size' (named as 'Peer Group Size' in the hypothesized model) is a variable of specific interest. For this variable, too, nesting is important. In order to account for causal relationships in a more meaningful manner conceptually as well as stochastically. VET entrants in identified program peer groups, need to be nested and analysed within the program peer group to which they belong. As Darmawan and Keeves (2009) pointed out, naturally occurring groups of students within schools were found to have members who were more like each other than students in other schools. Furthermore, educational researchers (Darmawan & Keeves, 2009; Niehaus, Capbell, & Inkelas, 2014; Raudenbush & Bryk, 2002) have pointed out that statistically not

accounting for the multilevel nature of educational data risked 'aggregation bias', involving an overestimation of the degrees of freedom, and a mis-estimation of the standard error as well as an increased likelihood of making Type I errors through the likelihood associated with an inappropriate number of cases.

Hierarchical Linear Modelling (HLM) is an appropriate multilevel technique for analysing hierarchically nested data. This approach utilizes a statistical multilevel model that can examine the separate effects of the student level variables from the program year cohort level variables and from the faculty year cohort level variables. The program used in this investigation is HLM, version 6. This program separates variance occurring at two or three levels. By doing so, this investigation estimates more appropriately significant explanatory variables at multiple levels of operation and observation. HLM. Version 6, is also able to examine moderation effects of second and third level variables for their direct influences on the outcome variable.

Within HLM, a non-linear analysis can be specified that is appropriate for binary data such as the outcome variable of this investigation, namely: student 'Drop Out'. Raudenbush and Bryk (Raudenbush & Bryk, 2002) described models with a binary or dichotomous first level outcome as cases where assumptions of linearity and normality of the expected outcome could not be assumed, and advocated the use of Hierarchical Generalized Linear Modelling (HGLM) for such cases. HGLM allows the assessment of a multilevel model with a binary outcome dependent variable, using a Bernoulli sampling distribution and a 'logit' link function. The logit link function introduces a logarithmic transformation, on the outcome variable, using the natural log of the odds ratio (in this case of drop out). This is represented by Equation (1):

$$Y = \text{Log} \left[ \frac{\varphi}{1-\varphi} \right] \quad (1)$$

The link function expressed in the right hand side of equation (1), is the natural logarithm of the probability of 'dropping out' ( $\varphi$ ) over the probability of 'not dropping out' ( $1-\varphi$ ). This is often termed as the 'Log-Odds'. The fraction component ( $\frac{\varphi}{1-\varphi}$ ) is also known as the 'Odds Ratio'. As Raudenbush and Bryk (2002) pointed out, the odds ratio and the probability of success (in this investigation this is the probability of drop out) are essentially the same measure. This can be found using Equation (2):

$$\varphi = 1/(1 + e^{(-Y)}) \quad (2)$$

The first or student level model, estimated by the HGLM analyses within HLM, is given by Equation (3):

$$\begin{aligned} Y_{ij} = & \beta_0 + \beta_1(\text{Student Level Variable 1}) & (3) \\ & + \beta_2(\text{Student Level Variable 2}) \\ & + \cdots \dots \dots \dots \dots \dots \dots \dots \dots \\ & + \beta_n(\text{Student Level Variable } n) + r \end{aligned}$$

Where Y is equal to the logit link function shown in Equation 1, and where there are *n* number of (level-1) student level variables that are assumed to have an influence on the outcome variable. The right hand side of Equation 3 can be recognized as having linear structural components. The symbols  $\beta_1$  to  $\beta_n$  represent the coefficients of the student level variables and *r* the level-1 random error. The intercept,  $\beta_0$ , in Equation 3 represents the average ‘log-odd of drop out’ for all students. In the multilevel model, this intercept varies between the programs (or more accurately the program year cohorts).

The second or program level model is represented by Equations (4) to (7):

$$\beta_0 = \gamma_{00} + u_0 \quad (4)$$

$$\beta_1 = \gamma_{10} + u_1 \quad (5)$$

$$\beta_2 = \gamma_{20} + u_2 \quad (6)$$

.....

$$\beta_n = \gamma_{n0} + u_n \quad (7)$$

Where the symbols  $\beta_1$  to  $\beta_n$  represent the coefficients of the student level variables that can be influenced by (level-2) program level variables (or more accurately program year cohort level in this investigation). The symbols  $\gamma_{00}$  to  $\gamma_{n0}$  represent the intercepts and the symbols  $u_0$  to  $u_n$  represent the random errors estimated by the program.

If a program level variable, (e.g. Program Level Variable 1) is assumed to have a direct influence on the outcome variable, it is entered with Equation 4 that then forms a new equation which can be represented by Equation (8):

$$\beta_0 = \gamma_{00} + \gamma_{01}(\text{Program Level Variable 1}) + u_0 \quad (8)$$

Where  $\gamma_{01}$  is the program level coefficient, in this case for Program Level Variable 1. More program level variables can be added to this equation if they too are also assumed to have a direct influence on the first level outcome variable.

HGLM can also assess if a program level variable has an indirect or moderating influence on the outcome through the slope of the influence of one of the student level variables. In this case the program level variable is entered into the appropriate equation (from Equation (5) to Equation (7)). For example if Program Level variable 2 is assumed to have an indirect moderating influence through Student Level Variable 1 it is entered in Equation (5) to form the new Equation (9):

$$\beta_1 = \gamma_{10} + \gamma_{11}(\text{Program Level Variable 2}) + u_1 \quad (9)$$

Where  $\gamma_{11}$  is the coefficient of Program Level Variable 2 estimated by the HGLM analysis. As for the other equations, other program level variables can similarly be added to this equation if they are hypothesized to have a moderating influence through Student Variable 1. Program level variables can also similarly be added to Equation 6 and Equation 7 to account for further moderating influences through the other student level variables.

Thus, this chapter presents the modelling of the variables assessed in this investigation within a multi-level framework and the results obtained using the HLM (HGLM), version 6 program.

The rest of this chapter is divided into four parts. The first part presents and discusses the Hypothetical Model derived from the Research Model described in Chapter 3. The second part discusses the Unconditional or Null Model and the available variance at the different levels of analysis. The third part presents the Final Model showing the best model solution for the variables tested, generated using the model generating strategy. Finally, the significant paths within the Final Model are briefly discussed within the summary of this chapter.

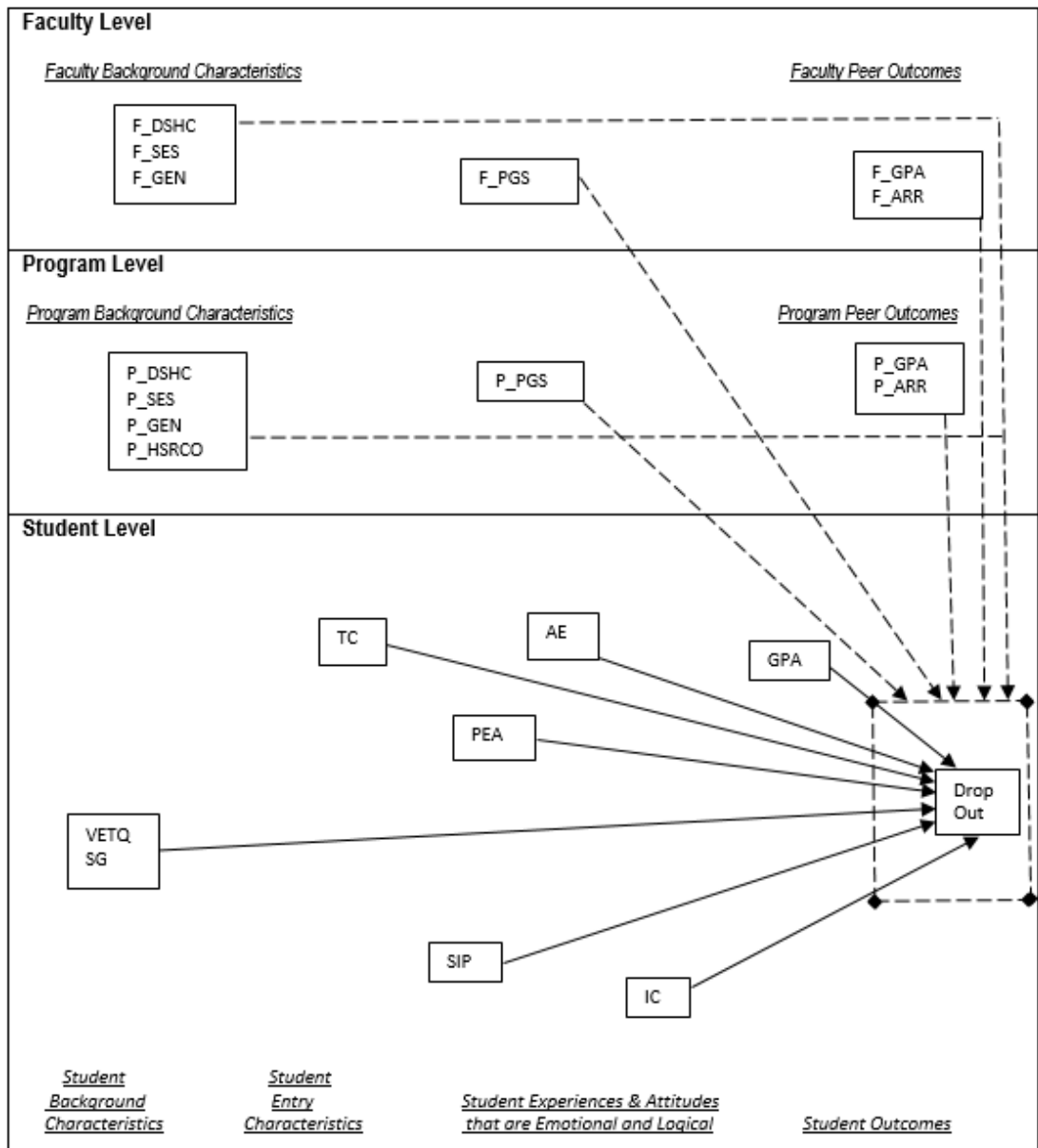
## **8.1 Hypothetical model**

In this study, 140 VET entrants responded to the survey out of a total population of 511 students. The students had entered the university between 2005 and 2012. Primary data from the survey are added to secondary student data, extracted from the university and state admission centre records. Secondary data for each student includes the program year cohort and faculty year cohort to which each student belongs. Data are collected for each program year cohort and faculty year cohort. This data set comprises the program or second level variables and the faculty or third level variables. These variables are recorded in Table 8.1. For practical purposes, only the student level variables that are included in the Final HGLM Model are included in Table 8.1.

Thus, Table 8.1 records the variables used in the HGLM analysis. All the variables are of a continuous nature apart from the outcome variable. Therefore, the use of HGLM is required. The hypothetical model, showing the hypothesized relationships between the variables in Table 8.1, involves six variables at the third level, seven variables at the second level and three variables at the first level of analyses.

**Table 8.1 Observed Variables in HGLM Modelling at Three Level of Analysis**

<b>Acronym</b>	<b>Description</b>	<b>Coding - Score</b>	<b>Variable Type</b>
<b>Faculty or Third Level Variables (descriptions, codes and scores relate to faculty year cohorts)</b>			
<u>Faculty Background Characteristics</u>			
F_DSHC	Faculty Domestic Student Head Count	Number of domestic students enrolled	Continuous
F_SES	Faculty Low SES Proportion	Proportion of domestic low SES students	Continuous
F_GEN	Faculty Gender Proportion	Proportion of domestic male students	Continuous
<u>Faculty Peer Group Size</u>			
F_PGS	Faculty Peer Group Size	Number of VET entrants	Continuous
<u>Faculty Peer Outcomes</u>			
F_GPA	Faculty GPA Average	Average GPA score (score range 0.00-7.00)	Continuous
F_ARR	Faculty Retention Rates	Number of peer students	Continuous
<b>Program or Second Level Variables (descriptions, codes and scores relate to program year cohorts)</b>			
<u>Program Background Characteristics</u>			
P_DSHC	Program Domestic Student Head Count	Number of domestic students enrolled	Continuous
P_SES	Program Low SES Proportion	Proportion of domestic low SES students	Continuous
P_GEN	Program Gender Proportion	Proportion of domestic male students	Continuous
P_HSRCO	Program High School Rank Cut Off	HSR cut off scores (score range 0-99.95)	Continuous
<u>Program Peer Group Size</u>			
P_PGS	Program Peer Group Size	Number of VET entrants	Continuous
<u>Program Peer Outcomes</u>			
P_GPA	Program GPA Average	Average GPA score (score range 0.00-7.00)	Continuous
P_ARR	Program Retention Rates	Number of peer students	Continuous
<b>Student or First Level Variables</b>			
<u>Student Outcomes</u>			
GPA	First Semester GPA	GPA (score range 0.00-7.00)	Continuous
<u>Student Experiences &amp; Attitudes</u>			
SIP	Social Integration with Peers	Factor scores calculated from 5 SIP item scores	Continuous
IC	Institutional Commitment	Factor scores calculated from 5 IC item scores	Continuous
<u>Outcome Variable</u>			
DO	Drop Out	Persisted (0), Dropped Out (1)	Binary



**Figure 8.1 Hypothetical three level model of student attrition from university for VET entrants.**

The path diagram showing the relationships between variables within and between the three levels is presented in Figure 8.1. HLM and HGLM can only assess direct influences on the student drop out outcome coming from the first level. This is evident from Figure 8.1, in the fact that it shows only direct arrows from the first level hypothesized explanatory variables. From the second and third level explanatory variables direct influences on the student Drop Out outcome can be assessed as well as moderating influences on the first level influences coming from the first level explanatory variables. For practical purposes, this is shown in Figure 8.1 as dotted arrows leading to the boxed area around the student drop out outcome. The boxed area thus

represents an assessment of both direct and moderating effects from the program level and faculty level variables.

Figure 8.1 shows that there are direct influences from eight student level variables. Placed in a temporal sequence, these are: VET Qualification Level (VETQ); Study Gap (SG), Transfer Credit (TC); Social Integration with Peers (SIP); Perceived Educational Ability (PEA); Academic Efficiency (AE); Institutional Commitment (IC); and First Semester Grade Point Average (GPA).

The second level variables shown in Figure 8.1 have a hypothesized possible direct influence on the student Drop Out outcome as well as hypothesized moderating effects on the slopes of the first level explanatory variables. Placed in a temporal sequence, the second level hypothesized explanatory variables are: Program Domestic Student Head Count (P\_DSHC), Program Low SES Proportion (P\_SES); Program Gender Proportion (P\_GEN); Program High School Rank Cut Off (P\_HSRCO); Program Peer Group Size (PGS); Program GPA Average (P\_GPA); and Program Retention Rate (P\_ARR). All the Program Level variables are assessed in separate year cohort groups

Similarly, the third level variables shown in Figure 8.1 have a hypothesized possible direct influence on the student Drop Out outcome as well as hypothesized moderating effects on the slopes of the second level explanatory variables. Placed in a temporal sequence, the third level hypothesized explanatory variables are: Faculty Domestic Student Head Count (F\_DSHC), Faculty Low SES Proportion (F\_SES); Faculty Gender Proportion (F\_GEN); Faculty Peer Group Size (F\_PGS); Faculty GPA Average (F\_GPA); and Faculty Retention Rate (F\_ARR). All the Faculty Level variables are assessed in separate year cohort groups.

It is also necessary to recognize that HLM and HGLM can only handle so called observed or manifest variables. Therefore, the latent variables included in the student level analysis in Chapter 7 are transformed into observed or manifest variables. This is depicted in Figure 8.1 as all variables are being represented by a rectangular shape, including three variables (Social Integration with Peers, Perceived Educational Ability, and Institutional Commitment) that were represented in Chapter 7 as latent variables. Statistically, this is done by reducing the survey items into factor scores using the SPSS program for each of the latent variables: Social Integration with Peers (SIP), Social Integration with Staff (SIS), Institutional Commitment (IC),



Institutional Membership (IM) and Perceived Educational Ability (PEA). Two of these five student level variables remain in the Final Model, and are shown in Table 8.1. These are: Social Integration with Peers (SIP); and Institutional Commitment (IC).

## 8.2 Null model

Before proceeding to the analyses of the various possible models derived from the hypothetical model that incorporate the explanatory variables at the three levels, in general, the outcome variable needs to be shown to vary across the second and third level groupings. In HLM the Intra-Class Correlation (ICC) is often used to report levels of variability between higher level groupings. The ICC is obtained from the analysis of the null or unrestrained model, where the outcome variable is not assumed to have any explanatory variables from the different levels. In this way, the distinct amount of available variance can be calculated coming from each of the levels in the hypothetical model. In the case of a binary outcome variable and with the use of HGLM, however, Raudenbush and Bryk (2002) suggested that this figure was less informative due to the resulting heteroscedastic first level variance and its impact on the ICC value.

Within the framework of a standard two-level hierarchical linear model, the intraclass correlation, that is, the ratio of level-2 variance to the total variation, is a useful index. Unfortunately, this measure is less informative in the case of non-linear link functions, because the level-1 variance is now heteroscedastic. For example, for the Bernoulli case the level-1 variance will equal  $\varphi(1-\varphi)$ , where  $\varphi$  is the predicted probability according to the level-1 model (Raudenbush & Bryk, 2002, p. 298).

Franke (2012), however, calculated the ICC using the Raudenbush and Bryk (2002) formula to obtain a reportable ICC in order to assess the amount of variance in the outcome variable between the first and second level groups. In this investigation, the same formula is used to assess the amount of variance available between program year cohorts and is given by Equation (10):

$$ICC = \frac{Var_2(u_{0j})}{\left(Var_2(u_{0j}) + \frac{\pi^2}{3}\right)} \quad (10)$$

where  $Var_{2(u_{0j})}$  is the variance of the random error component with respect to the program year cohort  $j$  and  $\frac{\pi^2}{3}$  is the approximated value for the variance available at the first level.

The results from the analysis of the two-level null model produces a value for the second level variance of the random error ( $Var_{2(u_{0j})}$ ) of 0.03. Using the formula recorded in Equation 10, the calculated amount of variance available at the program or second level is 0.01 (or 1%).

A similar formula can be used to assess the three-level null model, and is given by Equation (11):

$$ICC = \frac{Var_{3(e_{0j})}}{\left(Var_{3(e_{0j})} + Var_{2(u_{0j})} + \frac{\pi^2}{3}\right)} \quad (11)$$

where  $Var_{3(e_{0j})}$  is the variance of the random error component with respect to the faculty year cohort  $j$ ,  $Var_{2(u_{0j})}$  is the variance of the random error component with respect to the program year cohort  $j$ , and  $\frac{\pi^2}{3}$  is the approximated value for the variance available at the first level.

The results from the analysis of the three-level null model produces a value for the third level variance of the random error ( $Var_{3(e_{0j})}$ ) of 0.19. Using the formula stated in Equation (5), the calculated amount of variance available at the faculty or third level is 0.05 (or 5%).

A similar calculation can be made for the amount of variance available at the second level, assuming a three-level structure, by replacing the numerator,  $Var_{3(e_{0j})}$  in Equation (11) with the second-level variance of the random error ( $Var_{2(u_{0j})}$ ) of 0.39 obtained from the three-level null model analysis. The ICC formula for the amount of variance available at the second level assuming a three-level structure is given by Equation (12):

$$ICC = \frac{Var_{2(u_{0j})}}{\left(Var_{3(e_{0j})} + Var_{2(u_{0j})} + \frac{\pi^2}{3}\right)} \quad (12)$$

The calculated amount of variance available at the program or second level is 0.10 (or 10%). It is noted that the higher available variance totals estimated from the intra-class correlations are

estimations and the developers of the HLM program, Raudenbush and Bryk (2002), have not recommended their use for making decisions on whether to proceed to analyse models with explanatory variables from the distinct levels.

Unsurprisingly, there has been little consistency in the reporting of the total amount of variance available at the group level in higher education studies. Among the multilevel studies on student attrition reviewed in Chapter 2, only one of the studies, by Franke (2012), reported specific ICC values relating to the amount of variance available at the second level. Niehaus, Campbell and Inkelas (2014) recently noted that there was little consensus on the amount of variance needed at the group level of analysis, with studies in higher education ranging between 0.1 percent and 30 percent. They concluded that the decision to carry out multilevel analysis ultimately depended on the data and the questions of interest for which explanation was required. The relatively small amount of estimated variance available at the second level, when testing the two-level null model, is noted. As program Peer Group Size (PGS) is one of the main issues in this investigation, the multilevel analysis is continued to assess the influence of this variable, as well as other hypothesized second (and third) level explanatory variables on the first level outcome. The model generating strategy is used to generate the final multilevel model for this investigation.

### **8.3 Final multilevel model**

Following the modelling approach and the model generating strategy the final model is estimated from the available data. Non-linear analyses are used for both two level and three level solutions using a Bernoulli first level sampling model type. In order to estimate the parameters in the final two-level model the default restricted 'Penalized Quasi-Likelihood' (PQL) estimator is used and for the HGLM three-level model the default 'full' PQL estimator is used. As is the case for the null models, the 'logit' link is used as the first level link function for both two-level and three-level estimations. Using PQL, the analysis produces approximate empirical Bayes estimates of the randomly varying level one coefficients, generalized least squares estimators of the two-level and three-level coefficients, and approximate maximum likelihood estimators of the variance and covariance parameters.

While various three-level models are examined, no three-level model can be generated to include any significant explanatory variables of the student Drop Out outcome variable. This is due, in

part at least, to the small sample size. For the three-level models examined, the recorded maximum number of level one units is 71, of level two units is 22, and of level three units is only 12. In contrast, for the two-level model analyses, the maximum number of level one units is recorded as 140 and for level two units as 54.

The two-level model computations are able to estimate some significant explanatory variables. Following the model generating strategy the final model is generated which includes three student level variables as significantly influencing the student drop out outcome. Only one program level variable is found to have a significant influence. However, the influence is not a direct but a moderating effect through two of the three student level variables. The results for the final two-level HGLM model are shown in Table 8.2. The results reported are the final estimation of fixed effects estimated by the HLM program. They are the population average model with robust standard errors.

**Table 8.2 Estimation of Final Two Level HGLM Model**

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For Intercept 1, $\beta_0$					
Intercept 2, $\gamma_{00}$	-1.55***	0.17	-9.05	52	0.00
For GPA slope, $\beta_1$					
Intercept 2, $\gamma_{10}$	-0.63***	0.14	-4.59	51	0.00
PGS, $\gamma_{11}$	0.02***	0.01	3.66	51	0.00
For IC slope, $\beta_2$					
Intercept 2, $\gamma_{20}$	-0.52***	0.19	-2.69	52	0.01
For SIP slope, $\beta_3$					
Intercept 2, $\gamma_{30}$	-0.59***	0.21	-2.76	51	0.01
PGS, $\gamma_{31}$	0.01*	0.01	1.76	51	0.08

\*significant at the 10% ( $p < 0.10$ )

\*\*significant at the 5% level ( $p \leq 0.05$ )

\*\*\*significant at the 1% level ( $\leq 0.01$ )

Table 8.2 records that there are three student level variables that have a direct influence on the student Drop Out outcome variable. They are: student first semester Grade Point Average (GPA) (log-odds=-0.63,  $p=0.00$ ); Institutional Commitment (IC) (log-odds=-0.52,  $p=0.01$ ); and Social Integration with Peers (SIP) (log-odds=-0.59,  $p=0.01$ ). Table 8.2 also shows that there is only one program or second level variable that has any significant influence. The second or program level Peer Group Size (PGS) has two significant moderating influences on student drop out. The most

significant is through the student level first semester Grade Point Average (GPA) (log-odds=0.02, p=0.00). A second moderating influence is through the student level Social Integration with Peers (SIP) (log-odds=0.01, p=0.08). The intercept,  $\gamma_{00}$ , in the population average model reported in Table 8.2 is the expected log-odds of dropping out for a VET entrant with values of zero on the explanatory variables and the population average drop-out rate for this group (see Raudenbush et al 2004, p121). Converting the log-odds to a probability value (using Equation 2) in this case results in a population average probability of dropping out of 0.18. This figure is only slightly lower than the recorded average Drop-Out rate of 19 per cent in the descriptive statistics in Chapter 6. Raudenbush and Bryk (2002) suggested that such a difference could be attributed to the nonlinear relationships between log-odds and probabilities represented in Equation (1), and Equation (3).

Using the results shown in Table 8.2, Equation (3) can be rewritten with the substitutions made from the HGLM results as:

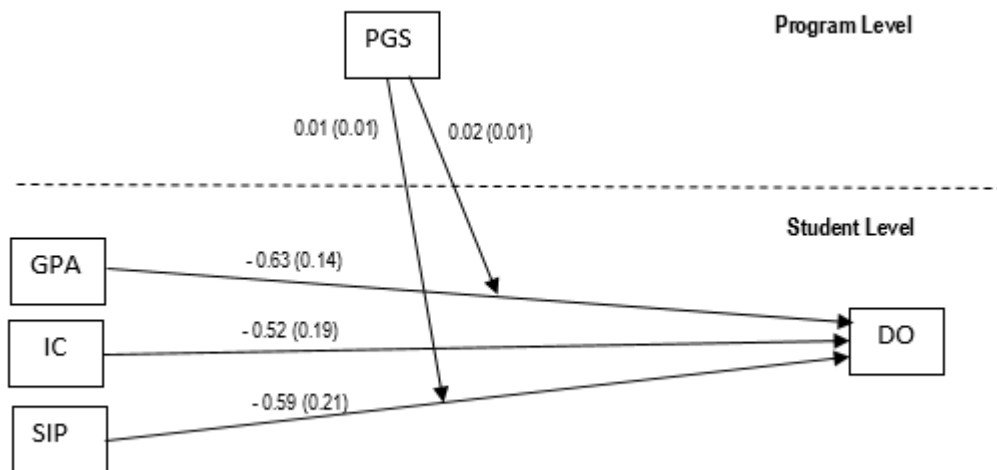
$$Y_{ij} = -1.55 - 0.63(GPA) - 0.52(IC) - 0.59(SIP) \quad (12)$$

where  $Y_{ij}$  is the log odds of drop out as shown by Equation (1). The 'odds ratio' is calculated using Equation (1) and the probability of dropping out can also be found using Equation (2), as is done for the calculation for the population average drop-out rate.

In order to account for the moderating influences (on the slopes of GPA and SIP), Equation (12) can be adjusted to incorporate the effects of Peer Group Size (PGS). The following equation accounts for these moderating effects as explained by the final two-level model:

$$Y_{ij} = -1.55 + (-0.63 + 0.02(PGS))(GPA) - 0.52(IC) + (-0.59 + 0.01(PGS))(SIP) \quad (13)$$

The configuration of the final two-level model is presented in Figure 8.2, which emphasizes the three student level direct influences on student Drop Out; from Grade Point Average (GPA), Institutional Commitment (IC) and Social Integration with Peers (SIP), and the two moderating influences coming from the only significant second level explanatory variable, Peer Group Size (PGS).



**Figure 8.2 The multi-level final model.**

The coefficients shown in Figure 8.2, and in Table 8.2, are expressed in terms of log odds. The log odds value for the direct influence of the student level GPA on student Drop Out is -0.63. Thus, a unit increase of GPA is associated with a lowering of the log odds of drop out by 0.63, while holding constant the other explanatory variables in the model. The log odds, thus, reduce from a value of -1.55 to a value of -2.18. This corresponds to a decrease in the probability of dropping out from the (population) average Drop Out of 0.18 to 0.10 (using Equation 2). Thus if a VET entrant has achieved a first semester Grade Point Average (GPA) equal to the average of 4.59, they have an 18 percent chance of dropping out. Whereas if a VET entrant has achieved a higher 5.59 Grade Point Average (GPA) they have only a 10 percent chance of dropping out.

Similar calculations can be made for the influences of the other student level explanatory variables, Institutional Commitment (IC) and Social Integration with Peers (SIP). Thus, while holding other explanatory variables constant, if a VET entrant records a higher than average (by one standard deviation value) Institutional Commitment score, they decrease their chances of dropping out from 18 to 11 per cent. Similarly, while holding other explanatory variables constant, if a VET entrant has a (one standard deviation) higher than average Social Integration with Peers score, they also decrease their chances of dropping out from 18 per cent to 11 per cent.

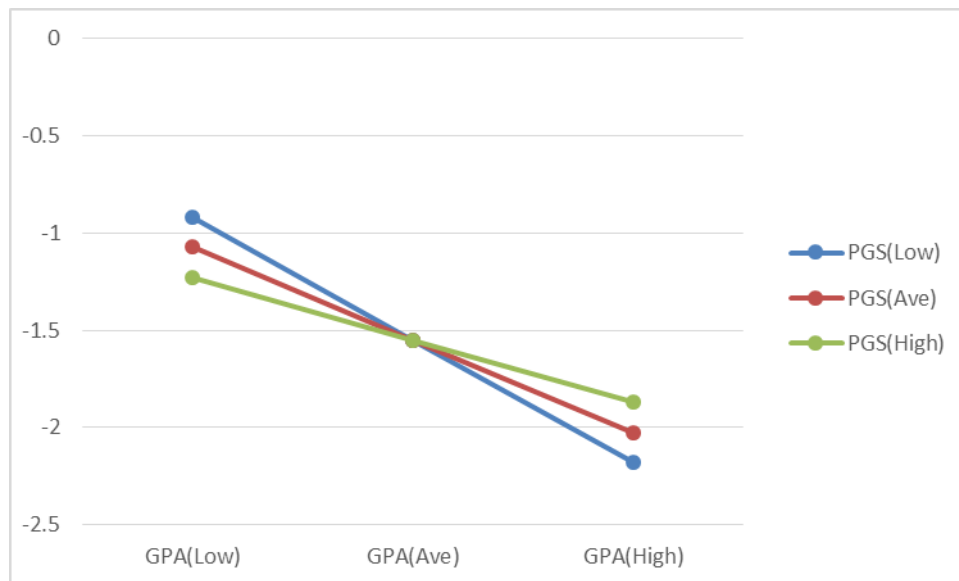
In order to appropriately interpret the moderating effects coming from the changes in Peer Group Size (PGS), plots are made of the change in slope for both GPA and SIP as the P\_PGS changes.

Derived from Equation (13), changes to the GPA slope,  $\beta_1$ , and the SIP slope,  $\beta_3$  can be calculated as the Peer Group Size (PGS) changes. For the case of Grade Point Average (GPA), Table 8.3 records how the effect of this variable on the student Drop Out changes as the Peer Group Size (PGS) increases from low, to average and then to high values. The mean Peer Group Size (PGS) of 7.67 is used for the calculations. In order to calculate high and low values, a standard deviation of the Peer Group Size (PGS) is added, or subtracted from the mean.

**Table 8.3 Log-Odds of GPA as P\_PGS Changes from Low to High Values**

	PGS(Low)	PGS(Ave)	PGS(High)
GPA(Low)	-0.92	-1.07	-1.23
GPA(Ave)	-1.55	-1.55	-1.55
GPA(High)	-2.18	-2.03	-1.87

The results recorded in Table 8.3 are plotted to produce three straight line graphs showing the GPA slope being moderated by Peer Group Size (PGS) at three points: at PGS(Low); PGS(Average); and at PGS(High). The graphs are presented in Figure 8.3.



**Figure 8.3 The effect of P\_PGS on the slopes of GPA on the log-odds of Drop Out.**

Figure 8.3 illustrates the three slopes which correspond to the GPA effect on student Drop Out when the P\_PGS value is low (blue line), when the P\_PGS value is average (red line) and when the P\_PGS value is high (green line). It can be seen from the three line graphs, as the Peer Group Size (PGS) increases the GPA slope flattens out. This is interpreted in the following terms: if the Peer Group Size (PGS) increases, Grade Point Average (GPA) becomes less influential on student drop out. Relating this back to the probability of dropping out, when the Peer Group Size (PGS) is low a student with a low GPA (a value of 3.59) has a log-odds of dropping out of - 0.92, corresponding to a probability of dropping out of 0.28. This probability decreases to 0.10 (log-odds=-2.18) for a student with a high GPA (5.59) and the same low Peer Group Size. The change in probability is 0.18 between the two values and relatively large. When the Peer Group Size (PGS) is high, a student with a low GPA (a value of 3.59) has a log-odds of dropping out of - 1.23, corresponding to a probability of dropping out of 0.23. This probability only decreases to 0.13 (log-odds=-1.87) for a student with a high GPA (5.59) and the same high Peer Group Size. This change in probability is 0.10 and much less than the change recorded when the Peer Group Size is low. Therefore, as the Peer Group Size increases the influence that GPA has on student drop out wanes. This can be seen as possibly a dampening or calming effect. So when Peer Group Size (PGS) is very low, Grade Point Average (GPA) is very important to the Drop Out decision. As there are more students of similar background (i.e, VET entrants) within the program that the students are studying a student's first semester, GPA has less of an influence on the decision to drop out.

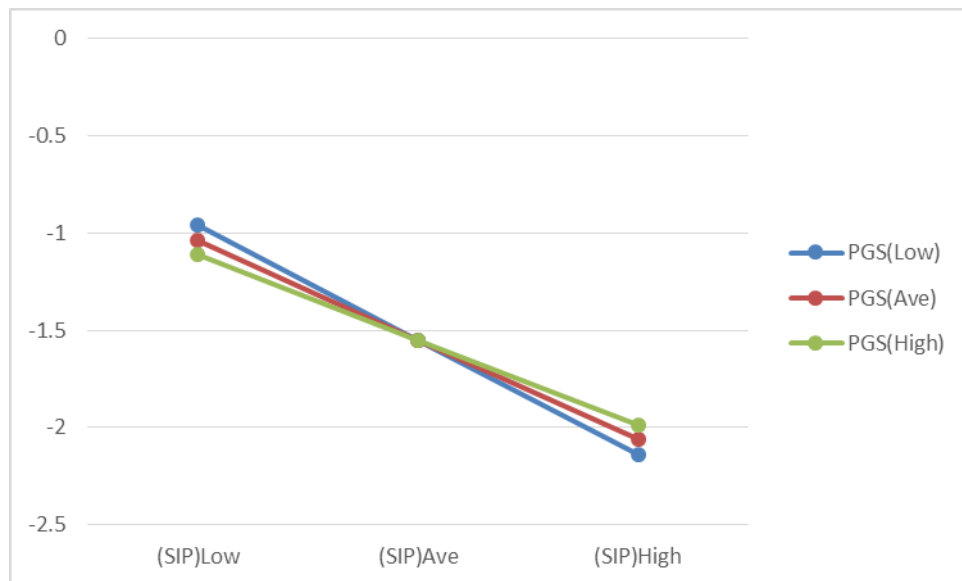
A similar analysis is undertaken for the moderating effect of Peer Group Size (PGS) on the SIP slope. For the case of Social Integration with Peers (SIP), Table 8.4 records how the effect of this variable on the student Drop Out changes as Peer Group Size (PGS) increases from low, to average and then to high values. The mean Peer Group Size (PGS) of 7.67 is again used for the calculations. In order to calculate high and low values, a standard deviation of the Peer Group Size (PGS) is added, or subtracted from the mean.

**Table 8.4 Log-Odds of SIP as P\_PGS Changes from Low to High Values**

	PGS(Low)	PGS(Ave)	PGS(High)
(SIP)Low	-0.96	-1.04	-1.11
(SIP)Ave	-1.55	-1.55	-1.55
(SIP)High	-2.14	-2.06	-1.99



The results recorded in Table 8.4 are plotted to produce three straight line graphs showing the SIP slope being moderated by Peer Group Size (PGS) at three points: at PGS(Low); PGS(Average); and at PGS(High). The graphs are presented in Figure 8.4.



**Figure 8.4 The effect of P\_PGS on the slopes of SIP on the log-odds of Drop Out.**

Figure 8.4 illustrates the three slopes which correspond to the effect of Social Integration with Peers (SIP) on student Drop Out when the Peer Group Size (PGS) value is low (blue line), when the value is average (red line) and when the value is high (green line). It can be seen from the three line graphs that, as the Peer Group Size (PGS) increases the SIP slope flattens out. This can be interpreted in the following terms: when the Peer Group Size (PGS) increases Social Integration with Peers (SIP), as is the case for GPA, becomes less influential on student Drop Out. Relating this back to the probability of dropping out, when the Peer Group Size (PGS) is low, a student with a low SIP value has a log-odds of dropping out of - 0.96, corresponding to a probability of dropping out of 0.28. This probability decreases to 0.11 (log-odds=-2.14) for a student with a high SIP value and the same low Peer Group Size (PGS). The change in probability between the two values is 0.17 and relatively large. When the Peer Group Size (PGS) is high, a student with a low SIP value has a log-odds of dropping out of - 1.11, corresponding to a probability of dropping out of 0.25. This probability only decreases to 0.12 (log-odds=-1.99) for a student with a high SIP value and the same high Peer Group Size (PGS). This change in probability is 0.13 and less than the change recorded when the Peer Group Size (PGS) is low. It is necessary to recognize that the change is less than the change recorded for the GPA slopes.

Therefore as the Peer Group Size increases the influence that Social Integration with Peers (SIP) has on student Drop Out wanes, as it does for the GPA but not to as great an extent. Since this is the case for the GPA slope, it can be argued to be possibly a dampening effect. As there are more students of similar background (i.e, VET entrants), within the program that the VET entrants are studying in, a student's Social Integration with Peers score has less of an influence on the decision to Drop Out.

### Summary

The multilevel HLM analyses of the VET student entrant data has resulted in a multilevel model with three explanatory variables from the student level and one explanatory variable from the program level. The final model, illustrated in Figure 8.2, records that student level first semester Grade Point Average (GPA), Institutional Commitment (IC), and Social integration with Peers (SIP) have significant direct influences on students' decisions to Drop Out. For all these three variables as their corresponding values increase the probability of dropping out decreases. The model indicates that students with higher Grade Point Averages are more likely to persist. Similarly, the VET entrants with higher recorded values of Institutional Commitment and Social Integration with Peers also have a better chance to persist than those students with low, recorded IC and SIP values. The single level path model reported in Chapter 7 and shown in Figure 7.2 supports these results. One difference between the models is that the Social Integration with Peers (SIP) variable has a direct influence in the multilevel model as opposed to an indirect influence through Institutional Commitment (IC) in the single level model.

In terms of program level explanatory variables, the HLM analyses have identified that Peer Group Size, one of the variables of interest in this investigation, does have a significant, but small, effect on student Drop Out. This effect is, however, a moderating one, which influences the direct effects of two of the three student level explanatory variables. Both the direct effects of Grade Point Average (GPA) and Social Integration with Peers (SIP) are moderated by the program level Peer Group Size (PGS). The model indicates that as the Peer Group Size (PGS) increases VET entrants may feel more at ease and are less likely to decide to Drop Out from low values of their first semester Grade Point Average (GPA) and their lower abilities to integrate socially with their peers.

## 9 Qualitative Results

The qualitative phase of this investigation involves interviews with 10 VET entrants that had agreed to take part. As described in Chapter 4, interviewees of varying backgrounds are selected to give a broader range of responses. As shown in Table 4.2, and repeated in Table 9.1, five males and five females take part and pseudonyms are given to the 10 interviewees, chosen randomly from common Australian names listed on a ‘common name’ website (Sullivan, 2015). Among the ten interviewees, there is an even number of students that drop out and that persist in their first year of studies at the university. The interviewees also represent a wide range of ages as well as other attributes. Some of these are presented in Table 9.1 to provide some background information on the interviewees.

**Table 9.1 Interviewee Attributes**

Interviewee	Drop Out Status	Gender	Age	VET Qualification Level (VETQ)	Academic Efficiency (AE)	Peer Group Size (P_PGS)	Academic Adviser Network Size (SN3)
Interviewee 1 (Olivia)	Persisted	Female	35	Advanced Diploma	1.76	4	0
Interviewee 2 (Charlie)	Persisted	Male	27	Certificate IV	1.28	6	2
Interviewee 3 (Ava)	Persisted	Female	22	Certificate IV	0.48	14	5
Interviewee 4 (Lucas)	Persisted	Male	55	Certificate IV	1.72	4	4
Interviewee 5 (Emily)	Persisted	Female	43	Advanced Diploma	1.12	5	5
Interviewee 6 (James)	Withdrew	Male	27	Certificate IV	2.15	16	0
Interviewee 7 (Emma)	Withdrew	Female	28	Diploma	0.57	16	0
Interviewee 8 (Michael)	Withdrew	Male	38	Diploma	0.8	8	2
Interviewee 9 (Charlotte)	Withdrew	Female	43	Diploma	1.33	6	0
Interviewee 10 (Oliver)	Withdrew	Male	23	Advanced Diploma	0.92	4	0

Table 9.1 shows the attributes of the 10 interviewees, who are considered in this investigation. The interviewees’ gender and age are presented together with their Drop Out status, that is, whether or not they persist or withdraw during their first year of studies. Also presented are the VET qualification levels achieved by the interviewees, prior to entering the university. Each of the

interviewees' Academic Efficiency score is given, calculated from their survey responses on perceived effort expended and perceived performance achieved. Finally, the Peer Group Sizes (of VET entrants) associated with the interviewees' program year cohorts are given as well as the sizes of the student networks used for academic support.

Each interview follows broadly the pre-prepared interview schedule shown in Appendix 5. Before each interview, interviewee university records and survey responses are checked, to ascertain specific points of interest and to make adjustments and personalise the interview schedule. For example, Interviewee 3 (Ava) has a very low Academic Efficiency, so questions around the length of time studying and perceived outcomes are developed further in preparation for the interview. In general, the interview schedule presupposes the issue as explained by themes associated with the notions represented by the research model shown in Figure 3.1.

The interviews generally take place in a private office within the university at a time convenient for the interviewees. Apart from email contact, the interviews are the first personal contacts between the interviewer and interviewees. The interviews vary in length from 40 minutes to over one hour, depending upon the length of responses offered by the interviewees. Rapport between interviewer and interviewee is built quickly in the first part of each interview, where the survey is discussed and the interviewees are given opportunities to clarify points of interest and to provide further information. The resulting interviews are recorded and transcribed. A thematic analysis of the 10 interview tape scripts is employed with the aid of the NVivo software program (see Creswell, 2014) as described in Chapter 4.

The results of the NVivo coding shows that there is general support for the factors of attrition that are identified in the quantitative analyses reported in Chapter 7 and Chapter 8. Overall, 15 themes emerge from the qualitative coding of the interview tape scripts. Table 9.2 shows the 15 major themes matched to notions represented in the research model shown in Figure 3.1 and to some quantitative variables explored in the quantitative analyses in Chapter 7 and Chapter 8.

**Table 9.2 Qualitative Major Themes Coded in 10 Interviews**

Qualitative Themes	Related Research Model Notions	Related Acronyms
Age	Age	AGE
Credit Transfer Issues	Credit	TC
Educational Self Efficacy	Perceived Ability	PEA
Effort and Efficiency	Academic Efficiency	AE
Financial Stress	Financial Concerns	FS, WHPW
Full-Part Time Issues	Enrolment Status	FTR
Group Size Awareness	Program Peer Group Size	PGS
Institutional Commitment	Institutional Commitment	IC
Institutional Membership	Institutional Membership	IM
Life Balance	External Pressures	FS, WHPW, FTR, PS
Mid-Year Entry Issues	Enrolment Status	SEM
Peer Relationships	Peer Network Sizes, Social Integration	SN1-SN4, SIP
Perceived Performance	Performance	GPA
Preparedness	Academic Background	VETQ, HSR
Staff Relationships	Social Integration	SIS

Of the 15 themes presented in Table 9.2, some relate to a single notion in the research model and quantitative data, for example the 'Age' theme. Other themes are more general, for example life balance, which is associated with the quantitative notions of Financial Support (FS), Working Hours Per Week (WHPW), Study Load (FTR), their Partnered Status (PS).

Overall, this qualitative phase of the investigation supports the results found in the quantitative phase. As space does not allow for all the notions represented in the research model to be explored qualitatively, specific focus is given to parts of the model which contain more original notions and ideas. The rest of this chapter, thus, presents the qualitative evidence gathered to support specific aspects of the notions involved in the research model relating to Peer Group Sizes and the unexplored notion of Academic Efficiency. These sections are preceded by an exploration of the multifaceted nature of the 'Drop Out' issue. The sections that follow therefore focus on: the multifaceted nature of the issue; an exploration of academic efficiency; the importance of peer relationships and student networks; and peer group size awareness.

## 9.1 The multifaceted nature of the issue

The qualitative data provide further evidence on several aspects of the student Drop Out phenomenon highlighted by the quantitative data. For instance, the multifactorial models of student 'Drop Out' examined in Chapters 7 and 8 suggest that, when VET entrants decide to withdraw from university they are considering several aspects of their academic and non-academic lives and the qualitative data reinforce this. The data also emphasize the complexity of the issue and that decisions to withdraw need to be considered in the context of students' lived experiences. In general, the qualitative data allow the exploration of the nuances of student experience and thus enrich the research findings further.

When asked for their main reason for dropping out, many of the interviewees confirm that, the decision to drop out is, often, not made for any one particular reason. Charlotte, for example, one of the women who had withdrawn in her first year, states this directly when discussing her reasons for withdrawing,

I guess there was a whole bunch of reasons behind [dropping out]. One was that I think they were..it was more aimed towards research instead of actually being practical work experience, it wasn't really preparing me for work...Two...the technology was terrible. Because I work fulltime, I really needed to do more stuff online, that wasn't a possibility ... so... and I guess the amount of reading that goes with it is actually quite demanding as well and ..... three assignments was also a bit of a push as well, so I actually looked at [another university].

Charlotte is aware that her decision to withdraw is not made for a singular reason. The words used such as 'I guess' and 'I think' at the beginning of the quote indicate that Charlotte, while being able to list several reasons for dropping out, is still reflecting upon and understanding the reasons for her actions. The first two reasons given, regarding the focus of her course not matching her needs and the lack of online opportunities, provide information on notions not yet covered by the quantitative analyses. However, they may also partly explain the third reason that is covered by the research model, a lack of commitment to the institution. Her comments regarding her interest in another university coming at the end of her statement allude to this

association. Later in the interview, Charlotte confirms that she switches her studies to another university, and, that she also drops out of this second university after a short period of time.

Other reasons for dropping out are given within Charlotte's quote. She points out that, while attempting to study, she is working fulltime, making it difficult to devote substantial amounts of time and effort to her university commitments. Charlotte stresses the amount of work and effort required to study, yet no allowances are made from her fulltime work schedule. She describes the amount of reading required as 'demanding' and the number of assignments required as "a bit of a push". The amount of work required for her studies seemed to have come as a shock to Charlotte. This suggests that Charlotte may have been required to put more effort into her studies than she was prepared to, for the amount of 'vocational' benefit gained. This idea is discussed in more detail in the next section of this chapter.

Other interviewees refer to multiple reasons for dropping while focusing on a single factor. For example, Emma, another woman that drops out in her first semester, states in an earlier part of her interview, that her main reason for dropping out is a lack of confidence.

So, I do have the ability but I don't have confidence in my ability. So when it comes to writing papers and stuff like that.... I really struggle, so I think I ended up dropping out and then when I'd got my results it turned out I would have passed.

The notion most responsible for dropping out put forward by Emma is a lack of confidence in her own abilities, a view supported by Emma's lower than average Perceived Educational Ability survey scores. Then, as the interview progresses, however, she reaffirms her 'struggles' with her performances mentioned in her first quote and with her commitment to staying at the university. She states, "I was struggling and I didn't have the confidence. It was stupid but when it came down to choosing study or work, I chose work. Even though, my husband said not to." In this latter part of the interview, Emma once again refers to 'struggling', indicating her poor academic performance as an additional factor, and again linking it to her lack of confidence. Finally, she chooses her work over her studies, despite having family support to remain at university. Her comments in both sections of her interview thus highlight the complexity of the issue and her rationalization of her decision to Drop Out. It appears that, for Charlotte, a combination of factors, having both negative and positive influences, lead Emma to decide to Drop Out.

Lucas, one of the older students who manages to persist and complete his studies, affirms that, particularly for older students with extended families, persisting means overcoming a number of issues. This is done, as Lucas suggests, by focussing on one own's needs, prioritizing time for one's own studies, and, to some extent, disregarding the needs of partners or of other family members. He states:

Well as you get older ...you well... you might have got to maintain your own house. Depending on the age, if you've got a family. I've got four grandkids. I love spending time with them. To go back to study, I was thinking about this just the other day, can be paralleled to wanting to be a perfectionist in any art form. You've got to be selfish to devote your time to it all the time. And study does just as much academically [as] it takes you away from family life. And some people that have gone back into it may not be prepared to sacrifice the time that is needed from the family life without a marriage breakup or health reasons that come into things. And I think they all exacerbate the whole thing on whether or not you've got what it takes to really want to finish the course.

Lucas's insightful comments suggest that he approaches university studies, knowing the challenges and the need to make 'sacrifices' in other aspects of his life. Once again, the importance of commitment is paramount in Lucas's view of the issue.

The importance of commitment among a multitude of other influences is also brought out throughout the interview with James, one of five interviewees who withdraws before their second year of studies. In contrast to Emma who struggles with the academic demands, James has no problems with getting high grades and, of the ten interviewees, has the highest Academic Efficiency score. However, James studies at university as a 'hobby' and finishing his degree is not a necessity. His Institutional Commitment survey scores are also below average, despite his well above average academic results. His priorities clearly favour a job that he is satisfied with and saving to buy a house with his new wife. James summarises the complexity of the decision in a few poignant words: "Life gets in the way, I guess".

James later reinforces this point when asked directly for the main reason for dropping out. To this question, he responds: "The rest of my life. Yes, unfortunately, it was something that other things took priority". As with Charlotte and Emma, it is not one solitary reason but a number of external



pressures that take priority over the study at university for James. In contrast to Lucas, James throughout his interview explains that he decides to devote more time to his family and his work rather than to his studies.

It appears that, the decision to drop out, for at least some of the VET entrants in this investigation, is made after the consideration of multiple aspects within an individual's personal situation. This multifaceted aspect of the drop out issue is also shown by students' comments coded as belonging to the emerging theme 'life balance'.

Olivia, a middle-aged woman, who manages to persist through her first year of university, is one of two students in the interviewed group who can reflect on dropping out, having withdrawn from undergraduate studies on a previous occasion. Olivia puts her first studies, from which she did withdraw, in a context, which includes working:

I was working in hospitality as well at the time. So the demand on me to financially support myself, to actually live, and the need to obviously get a wage and the availability of work for students,...you know... I was working four or five nights a week until five o'clock in the morning you know... so the work that I had to do in order to sustain myself was incompatible with the lifestyle that I actually needed to lead... to be an effective student.

It is evident that Olivia is discussing the financial stresses of being a student. Sustainability in her discussion is the payment of her accommodation and for her food as well as for any incidental costs of her studies. Evidently, Olivia needs to continue to work to support herself while studying.

A balance is also required at home, whether students are living alone, sharing with their families or with friends. As is the case for many students that can only afford shared accommodation while studying, home life can also be an issue. Olivia's shared accommodation, which is away from her parental home, is not conducive to allowing the focus on her studies, the first time round, she thinks she needs.

You actually have to be able to manage life. It's not just, rock up to school, and do what you have to do..... and get home and your parents or guardians are nagging you, saying "Olivia do your homework". You know.. you're living with friends. Well... I was. I moved

from [country town] to Adelaide, I was living with my sister and some friends and we, you know ....there was no structure to that environment.... you know... we were all doing our individual things. There was no one that was kind of saying "right, today we are all doing this". When you got home there was no one saying "what did you do at uni today Olivia?.. have you got an assignment due? When is that?".

The suggestion made in these comments is that a supportive environment at home for a student is important. While the variable State of Origin is included in the quantitative analyses, to investigate whether movement across states is a factor influencing the Drop Out decision, Olivia's comments suggest that it is the supportive household which is more at play and a possible factor involved which may or may not take place as students move between states. This notion is also supported by Charlie, a 27 year old student who consciously moves back to his familial home during his first year of studies and is able to persist partly because of the support and encouragement he receives at 'home'.

Many of the issues coded within the 'life balance' theme also relate strongly to the financial stresses of studying, a notion which this investigation is picked up in the notions of 'Working Hours Per Week' and 'Financial Support'. The effect of working is an interesting aspect for many of the VET entrants. Unlike Charlotte, Olivia drops the amount of working hours per week to accommodate her studies in her 'second time round' studies. She does, however, seem to maintain a level of working hours in her first year of studies which may be beneficial to her ability to persist. This point is discussed in the next section focussing on 'Academic Efficiency'.

Before looking at this undescribed concept, the views of another interviewee, Michael, a mature aged man, who discontinued his studies in his first year, add another dimension to this complex issue. Michael describes his need to prioritize his studies over other aspects of his life.

Yes. I'd live it. I lived it. That was it. I'd done it. My wife complained. She said "all you do is read, that's all you do". I was, like .....from the first thing in the morning to the last thing I do at night, I studied. Even when I was socialising ....having a beer, I'd be reading at the same time. I'd be out in my bar room, having a beer, watching the footy, but I'd be reading and have my laptop doing... you know what I mean. I had no free time whatsoever. I put everything I had into it.

The comments made, emphasize the struggles with family and friends and with, seemingly, all other aspects of his 'normal life'. Michael felt he had no time for anything but his studies. From his efforts of studying from morning until night, it appears Michael has no shortage of institutional commitment. Eventually, however, it is a single event, which 'tips' Michael into making his decision to drop out from his studies.

I was doing our last [mathematics assignment] and I put a lot of work into it. It was all English, no maths. And my wife was grading it, spellchecking it..... and it disappeared because the USB, she was working off of, was full. And, I probably done 48 hours work on it, continuous, and it just disappeared. And, I had to hand it up the next day... and I just went 'that's the final straw, I'm not going back I'm going to get a job'.

The amount of effort, which Michael puts in, in this last assignment, has a negative effect on Michael's ability to persist at university. In this instance, the effort expended has little benefit for Michael, as he most likely perceives this last assignment to be a failure. Thus, Michael and Olivia, as well as depicting the studies within a context of a life full of other issues demanding attention, which may or may not take priority, also highlight the emergence of a factor, which is defined in this study as 'Academic Efficiency'.

## **9.2 An exploration of 'Academic Efficiency'**

Academic Efficiency has been broadly defined by: the amount of effort taken to achieve an acceptable level of perceived performance (see section 6.3 page 205). In quantitative terms, it has been calculated by dividing 'perceived performance' by 'perceived effort'. Quantitative values for this concept thus express the amount of perceived performance each individual VET entrant achieves for one unit of effort. The better the value, the more efficient the student is in using the one unit of effort. Qualitatively, the notions of effort and the benefit gained are vital to its identification. As previously argued, Academic Efficiency also allows for an evolutionary biological view of the decision making process. Eagleman (2015), recently noted, humans, like other animals, may have been hardwired to seek rewards, but unlike other animals could regularly extend decision making to attain abstract rewards such as obtaining a degree. He discussed the concept of 'anticipated reward' and the way in which humans decided on a path, which led to the

highest reward using some common 'currency'. Academic Efficiency, in Eagleman's framework, can be seen as a possible common 'currency' to obtain, in this investigation, an undergraduate academic qualification. Much of the following discussion is based on the student quotes coded and placed in the 'effort and efficiency' theme. The qualitative analysis of this construct demonstrates that Academic Efficiency is a complex construct of which the student might or might not be conscious.

Olivia and Michael express the two ends of the spectrum in terms of Academic Efficiency. Olivia, on the one hand, seems to have a high level of control of her 'Academic Efficiency'. As noted earlier, this occasion is her second attempt to complete a degree. When asked about her decision to come back to university, her first response highlights the way in which her anticipated efforts (for any anticipated rewards) were influential to her decision to return.

*Interviewer* - Coming back would have been a big decision for you.

*Olivia* – Oh yeah, that's the thing. I had to think about it... was it worth it.... do I really want to do this. The first time round I didn't have much success.

The meaning of worth in this comment can be viewed from various perspectives, one of which refers to the amount of effort, which Olivia believes she will need to expend. This notion is repeated throughout her interview. In the next quote from her interview, Olivia demonstrates reflection and adaptation to enhance her Academic Efficiency.

*Interviewer* - so you were working when you first started ....40 hours a week.. so full-time?

*Olivia* – Yes.

*Interviewer* - So that must have been an aspect that you thought about when you started. Did that have an impact?

*Olivia* - It did. Obviously [on] how many subjects I could do. So, I was studying part-time but I tried to do two subjects per semester and that just wasn't workable.

*Interviewer* - Was that the first one that you started?

*Olivia* – No, no. Actually that was probably about 12 months ago now. I did two subjects per semester but it was a really heavy workload. And it did affect my grade in at least in one of the subjects. So then I dropped back again to doing it part-time ...like..one subject per semester.

Olivia adjusts both her work and study workloads, as she is aware of the effect both are having on her grades. Once Olivia reduces her commitments, she is conscious of the amount of effort or energy she needs to invest as she describes some of the factors that have led to a successful return to studies:

I think that's the thing you know and maybe it's to do with my age and with the fact that I have worked... I don't know.. I think ...and this time around, as well, I have made a very conscious decision and a very informed decision about what I want to study and where I want it to take me in the future. So I am really clear about why I'm doing it and I have got the motivation and I am confident in myself and in my own abilities. So, I know what it is that I can do. I know how much time it takes me to, say, write an essay... like write a 3000 word essay. I know how much time I need to invest in the research in putting it together.

In her description Olivia is very precise about the efforts needed, she is confident in her estimation of time taken to complete a task, even specifying the number of words for her imagined 'essay'. Of note also is that Olivia reinforces the importance of commitment and confidence in her own abilities, reinforcing the complexity noted earlier. Insightfully, she believes that her abilities may have been developed by either age (Olivia is 35 when she first enrolls in her second-time round studies) or work. The quantitative results support the latter, that is, working appears to be involved in enabling students to become more academically efficient. Her earlier comments describing the connection between her work and study environments support this connection between study efficiency and working:

I already had full-time work. So I already invest a lot of time and energy and I have a lot of friendships and relationships in that aspect of my life and really University was something that I'd come and do what I needed to do and then I'd get the hell out because I didn't have time or I don't have time... you know what I'm saying ...at that time, when I was still working full time, I didn't have enough left over energy, I suppose, to invest in that aspect of university life.

Olivia is quite clear, in this instance, that due to her work commitments, her study time needed to be efficiently used. She reaffirms the importance of the Academic Efficiency notion later in her

interview and highlights the levels of performance she can achieve and with which she seems satisfied:

I knew exactly how much I needed to put it, in order to get at least a pass. In doing that I sometimes got better than that.... you know... so if I really apply myself I can get a high distinction without blinking but...I know how much I need to do in order to get at least, say, a credit.

Olivia seems very much in control of the amount of effort needed to attain a specified grade. Her use of the term 'without blinking', connected to obtaining high levels of performance, reinforces this high level of control. Thus, her decision to reduce the amount of working hours per week allows Olivia to spend more time and energy on her studies and achieve better, more satisfying results.

The quantitative path model, shown in Figure 7.2, supports Olivia's 'Age', on the other hand, influencing her decision to start with a reduced, or less than fulltime study load, which in turn negatively influences her relationships with other students. But, as she later elaborates, Olivia also achieves a level of 'efficiency' in her contacts with peers and staff. When discussing her relations with other students, she is very calculating and efficient with her efforts, which, once again, are focused on attaining a required level of performance:

and apart from if I had to, say, do group work on that basis ..and then I would exchange phone numbers with people... but it wouldn't be to maintain a friendship with them. It would be purely for the purpose of getting what needs to be done, done. And again I don't really involve myself in any of the other activities outside of tutorial or lecture.

In this quote, Olivia shows that she constantly assesses her input of effort. She minimizes any effort that she feels is not necessary, whether it is to make friendships or to take part in extra-curricular activities. Olivia also applies this to her contacts with staff. When asked about her contacts with administrative staff, she refers to getting the 'job done', and describes, her relationships with administrative staff as friendly, polite and most importantly effective. Thus in all of Olivia's comments discussed above, the notion of 'academic efficiency' seems to be an

important notion influencing the ability to achieve acceptable results, as well as to persisting into the second year of studies.

Unlike Olivia, Michael spends excessive amounts of time in his first semester to achieve acceptable levels of performance. In his description of his efforts to complete one of his first assignments, this inordinate amount of effort expended is evident:

Our assignment ..... I done very well. For instance if it was out of 50 I would get 48 or 49. But what I was doing was taking so long to do them because I was doing algebra with English-based logic. So, I would spend 20 or 30 hours on an assignment nutting out things .... doing algebra with English. A kid would come along and get his calculator out and go bang bang bang bang and put a number down and get a full grade whereas I would write 3 paragraphs of English logic to come to the same answer.

As Michael points out, the amount of effort he takes for the task is much more than he perceives his peers would take. In his opinion, a younger student may have taken much less time to complete the task. Michael perceives his younger peers as being more efficient as they can simply 'go bang bang bang' and get good grades. In this case, at least, he is satisfied with his own results as he receives close to full marks. But this inordinate amount of effort repeated for the task described in the quote on his 'last assignment', results in no such reward, as he loses his work (see page 259). For Michael, this is 'the last straw', suggesting that Michael had been weighing up this reward/effort relationship for some time before his final decision to drop out. The total effort needed to complete the degree studies is also important in Michael's assessment of the situation. In an earlier part of the interview, he describes his efforts during his hour-long trips into the university campus:

I found because I lived way in the north, I was doing a lot of reading, I was getting my wife to drive, she worked in the city as well, and I do most of my revision reading in the hour drive to and from work. So two hours a day was taken up through travelling. So that pressurized me, even though I was doing 3 subjects. And then I projected that and I thought "well fourth-year, four subjects this is just going to....."

As Michael reflects on his drives with his wife into the city to attend his studies, he seems to be using Academic Efficiency as a way of predicting the future efforts needed to obtain a degree, much in the way that Eagleman (2015) suggested the existence of a 'common currency' to project future alternatives. Taking into account such thoughts, his 'last straw' comments from his previous quote seem rational. It is quite possible that Michael was waiting for such an opportunity as losing an assignment to justify his decision to drop out.

One other student who withdraws in his first year of studies needs special mention. Oliver enrolls into a program after having completed a VET Advanced Diploma, and an undergraduate degree at another university. Throughout the interview, Oliver emphasizes that he was a mid-year entrant, suggesting that this may have had a negative bearing on his experiences, an influence supported by the quantitative results showing that entering in the second semester negatively affects academic performance.

When he first enrolls, Oliver is single and has no work commitments while studying, but has problems in finding enough time for the effort needed for his chosen program of study. Oliver recognizes that he often struggles and has to put a lot of effort into academic activities. He first enrolls on a fulltime basis but is then forced into lowering his study load because of the excessive workload. He describes and reflects on his experiences at his previous university and at the university he was studying for this investigation:

I was full time and then having to drop down to part time.... because I was unable to deal with the workload.... which was really weird for me because I have never gone part-time before. The fact that I was always, when I was studying arts I was there from nine till nine every day, and when I was in [another university]... I was..... my contact hours were like 30....32 hours a week. And then having to drop down to two or three subjects [at this university] with you know like ten contact hours a week was just sort of absurd to me. I was like.... you go in and you work. On numerous days I would just get up and go to university and just work. Simply so I was there and I was doing things, rather than being at home and going "oh this is just ridiculous."

The decision to drop two of his subjects and subsequently continue his studies on a half-time load is for Oliver a decision made begrudgingly due to inordinate amounts of effort required. His



comments also suggest that despite dropping to a half-time study load, unlike Olivia, Oliver continues to put a 'fulltime' worth of effort in his reduced study load. Although he admits to being a 'struggler' in his interview, he describes the situation as unprecedented and 'ridiculous'. Later in the interview he is asked about his results.

*Interviewer* - So you did do a little bit of study here .....and you got ....you passed. Your thoughts of your grades..... you probably wanted to do a little bit better?

*Oliver* - Absolutely, I was. I think, possibly because I was so enthusiastic, and I was really making the effort to adapt, that I just kept on getting very lousy scores. Assignments that I had a great deal of background knowledge in, and had a great deal of.... and I'd done a great deal of research in, rather than just 'dodged up' the night before the assignment.... and I would barely receive 50 per cent for it. "So wait a sec, what am I doing wrong?" It was then also led back to the fact that no one would communicate with me properly, about how I could improve things.

While the results obtained by Oliver may seem to be satisfactory for some, for him they do not make up for the amount of effort expended. These results are supported by a qualitative study undertaken at Victoria University. Milne Glaisher and Keating (2006) found that VET entrants who reported intentions to withdraw from their studies often reported excessive amounts of effort associated with their studies. Oliver also points out that he cannot find either peer students or academic staff to help him become more effective in his studies. This is supported by the quantitative results and discussed further in the next section of the chapter.

In summary, it seems that those students, like Olivia, that can make better use of their expended efforts in term of achieved performance are less likely to struggle with their academic grades and their persistence. Those students who cannot, must resort to expending excessive amounts of effort to achieve their results. These students, like Michael and Oliver, are more likely to struggle with their performances and less likely to maintain these efforts in the longer term.

Oliver's last comment, from the reported quote above, stating that 'no one would communicate' with him, leads this argument to a discussion of another set of factors of academic success. Our next part of this chapter discusses the importance of peer relations and student networks.

### 9.3 Peer relationships and student networks

Having positive relationships with fellow students seems to be an important factor of success at university. Social integration, as a notion has been a central factor in the early theoretical models of student attrition described in Chapter 2, such as those by Spady and Tinto, shown in Figure 2.1 and Figure 2.2.. Subsequent quantitative studies have consistently shown social integration involving an influence on institutional commitment and students' decisions to withdraw (Braxton et al., 2014). Student networks have also been shown to be important to adapting successfully to the US university environment (Hays & Oxley, 1986) and to student academic success and persistence (Thomas, 2000). Past qualitative studies on VET entrants have also shown the importance of student peer relationships to student success and persistence (Keating et al., 2006; Milne & Gabb, 2007). The following discussion refers to many of the comments made by the interviewees during their interviews and coded under the theme 'Peer Relationships'.

As pointed out, Oliver, one of the interviewees who did not persist into his second year of university studies, has problems connecting with his peers. In his first part of the interview, Oliver describes his first attempts at socializing with peers through the student association, an organization run by fellow students, which runs clubs and other activities for the benefit of students:

It was certainly worthwhile being at the University to learn. However, I found that while the student association was trying to, you know, present opportunities for people to meet and to socialise that some of it was just not necessarily targeted so well. A number of the students had already established cliques, and that were very unwilling to allow, you know, any people to become involved. I believe a number of the tutors that I had were.... only like Masters students or Ph.D. students themselves. So they knew people at the University as well and I found it particularly difficult to communicate with them as well because they were still involved in those cliques.

On this occasion, Oliver discusses his first communications with the student association at the university. Oliver describes the organisation as not 'targeting' their social opportunities very well. This appears to be a diplomatic way for Oliver to express that the association is not communicating effectively with him. The word 'clique' in his quote suggests that student groups

within the university student association are not inclusive enough to admit him inside.

Interestingly, two other interviewees, Emma and Charlotte also use this word to describe groups within their programs. Oliver also views some of the tutoring staff as being, unlike himself, inside the 'cliques'. In a later part of the interview, Oliver elaborates on how he feels excluded from student association activities:

Some of them [the students] were just awful at communicating. They were just awful at organising events. And I would receive e-mails with the latest minutes of which... because they presumed that everyone knew.... because they would socialise with each other..... that they didn't send out invitations or reminders, which then cut me out of the group again.

Oliver feels isolated from his fellow peers and his attempts to join student organisations only seems to exacerbate the problem. After receiving incomplete information from the association, Oliver concludes that his peers, inadvertently, exclude him from the association. The feelings that university associations are barriers to social integration are shared by another interviewee, Emily, who joins the mature age association at the university but is similarly ignored. Oliver makes several attempts but cannot socially integrate with his student peers. In his descriptions of some his interactions, Oliver points out that he is unsuccessful in prescribing to some of the norms associated with university student culture, as he perceives it.

Also being a non-drinker....a lot of the... it's not like I absolutely get involved in all the activities that are associated with drinking.... I often catch up with my friends at the pub. I just don't happen to drink alcohol. And a number of people would just completely dismiss me because I would go to the uni bar and I wouldn't drink at the uni bar.

The social meetings at the university bar are obviously uncomfortable for Oliver. Whether it is Oliver's abstention from alcohol or whether it is being placed within student groups that are unlike him, he is uncomfortable in these social settings. In the survey, Oliver identifies two acquaintances and when questioned on this, he describes them as mature aged transferees from a similar background:

The mature ages of his acquaintances and of himself seem to be a theme that is present throughout his interview and the interview of most other interviewees. When questioned about

age differences Oliver is aware of the ages of his acquaintances as well as his other 'program' peers.

*Interviewer* - Was there [an age difference]... for that particular degree?

*Oliver* - A number of the degree ...people in the degree I found were only a couple of years younger than me.... two maybe three at the most..... which is not a very big gap..... but even so still, the communication problems were very much there.

As Oliver points out, he is able to gauge the age differences between himself and his peers as only being two to three years different. However, Oliver seems to dismiss age as a factor of social integration, he expresses that the age difference is not 'too much of a problem'. Oliver's conclusions are supported by the quantitative results, which suggest that increasing age is an influence on social integration only indirectly, through its effect on lowering the study load. Oliver himself, as mentioned previously is forced into reducing his study load to a halftime basis.

In any case, Oliver finally reacts to the 'communication problems' and the negative social pressures and excludes himself from his peers, firstly by turning to the academic staff for help.

*Interviewer* - And of course you've shown here [in the survey].... that you didn't have anyone to bounce ideas off, for example, for your essays or your assignments....

*Oliver* - I mean when I got to the point in which I actually have to go to, like, some of the professors, just to ask questions of, rather than I would normally do to the tutors or the lecturers or just like the course coordinators. And I couldn't get access to any of them. Or the questions that I ask them were terrible. They would give me terrible answers. I remember on one occasion I got an e-mail back saying "ask me this during the workshop.... just ask me then".... Yes, but that's like five days away. This assignment is due in two days' time. I can't wait.

Oliver, at this stage seems to have few support structures to guide his progress through the study program. Towards the end of his interview, Oliver expresses how he isolates himself from his academic activities. While recognizing that he has at least two acquaintances in his program, Oliver describes how he feels about the program lectures:

*Interviewer* - And going back to those peers that you had mentioned you had two peers.....how did you interact with them? Was it just a friendly chat or....?

*Oliver* - People that I was sitting next to in lectures.

*Interviewer* - So you didn't really get any help from them?

*Oliver* - They were just there for the lectures, you know. I mean I had stopped seeing familiar faces as people. Just went "screw it.....I'll just read the online notes".

Oliver's final statement here is very telling. It appears that he no longer attends the lectures and instead reads the online notes to obtain his academic program content. While this might be sufficient for some students, James and Charlotte also expressed how they relied on online lectures and online materials for their studies, for Oliver this seems to be a reaction to his inability to connect with both peer students and academic staff.

These feelings of social isolation are mirrored by Emma. She also describes her fellow students as belonging to 'cliques' as she explains her struggles with making friends at the university:

I think one thing I struggled with was.. there was a session for older students the day that that was on, I was actually working, so I couldn't go and so I did feel a bit out of place and struggled to make friends just because I was older. Obviously I wasn't the oldest that you do get, but compared to the students coming fresh out of high school... they seem to have little cliques and they're there to hang out at the bar all that sort of stuff I didn't really get along that well with anybody. I didn't make friends very well so it was uncomfortable in lab practs [practicals] and tutes [tutorials] and stuff like that.

Emma describes the cliques of younger high school graduates who 'hang out' together. She feels 'a bit out of place' amongst these younger student peers. Emma, like Oliver, mentions being at 'the bar' as an aspect of university student culture she cannot adhere to. These feelings of not being part of the norm are transferred to Emma's academic activities. Emma describes the atmosphere in her practical and tutorial sessions as 'uncomfortable'. Practical and tutorial sessions, are traditionally a place where smaller groups of students can engage in academic discussions. Emma's struggles with her academic endeavours, on these occasions are compounded, as she is not comfortable communicating and possibly seeking help from her fellow students.

Like Oliver, Emma is isolated when at university. When asked about her peer relationships, she simply states:

I like had a few people that I spoke to .... but no proper friends, nobody who I keep in contact with.....But I didn't really do anything else at uni except come for classes..... I guess I'm just not very good with people anyway.

In Emma's case, her decision to engage with the university only during classes seems to have been made more quickly than in Oliver's case. Emma does not highlight many efforts to communicate with other students. Moreover, she recognizes that the lack of social integration may be due to her own lack of confidence in her own abilities to mix with other people. Her final comment suggests that it might be her attitude that inhibits her social integration at the university.

Emily, a 43 year-old VET entrant, is another of the interviewees that has difficulties with her peer relationships. She, like Olivia, is able to use hindsight in her comments, as she has returned to university studies after failing to persist in her first attempt many years earlier. Her insights into the issue are often based on her first unsuccessful university experiences. Her quote from the first part of her interview is full of insight and reflection on several social aspects influencing her decisions to persist with her studies:

I had expectations coming back to uni that it would be very social, a very kind of warm environment to be in. And you meet other students and you make friends. I had the opposite experience in first year. I can now talk about that in more context. I don't know whether it was... it's not that I am ...I don't look older so I don't even think it was my age. It was a very closed kind of student group. I found it very difficult to make friends partly because I was part time and was working I wasn't on campus all the time I felt maybe that was part of the issue that I wasn't there all the time but to me it was incongruent with the fact that in [the program I am studying] you do all your subjects together so you should have that connection because you're all together all the time. I'd find I'd stand next to someone in a line in the cafe and they wouldn't even acknowledge me even though I might be in the same tutorial group with them. So there is this real sense of like kind of isolation.

In her explanation, Emily, on reflection insightfully, identifies several influencing factors, including part-time study and age that are supported by the quantitative analyses for this group of students. She recognizes that not being on campus 'all the time' may have negatively influenced her abilities to make social connections. It seems that unlike Oliver and Emma, Emily is able to persist to continue her studies despite her social integration hurdles. Interestingly, it may have been a reduced workload that eventually helps Emily overcome her social integration issues in her second year. As she explains:

But now I'm with a whole different group because I have dropped back a year and it's completely different. It's exactly what I thought it would be like, you know. It's like really friendly. From day one I started, everyone talks to everyone. I felt really ..... I've got a lot of friends this year that I have made in a few months, than I have made in the whole time that I was with this other....

Of particular interest in Emily's quote is a clear perception that different year cohorts are very different to each other. This investigation, however, is focusing on the first year experience, which Emily describes as the most challenging. She states:

By the end of the year, I had made some friends.... by the end of the year so it did improve. I'd say the first semester was the worst..... By the end of the year I was sort of feeling a bit more comfortable. But it was still very much that sense of that you had your one friend.

So, for Emily the most difficult period is the first semester, through which fortunately, she is able to 'persist'. Also unlike Oliver and Emma, Emily is at least able to communicate with peers to get academic advice. When questioned about the student networks section of the survey, she explains that despite not having 'friends' as such, she is able to get some academic help from her acquaintances:

*Interviewer* - The next section is to do with those friends that you've been talking about. You said you made seven acquaintances, but...

*Emily* - None of them...

*Interviewer* - you put as personal friend yet you did consult them as ...

*Emily* – Yes. One thing in architecture, because you're all doing the same subjects, you tend to talk a lot about your assignments. You do ask each other “well what are you doing for this and how would you do that?”. That's often a topic of conversation you talk a lot about.

*Interviewer* - So you were at least able to do that.

*Emily* - With the friends that I did have, acquaintances, they were mainly people that I would just see at uni.

Emily is of the impression that her program is particularly influential in this aspect as the students do the same subjects throughout the first year. As mentioned previously, this is the case for many of the program year cohorts in this investigation. In any case, Emily unlike Oliver and Emma, is able to have discussions about her assignments. According to the quantitative data, this academic advice has an influence on students' performances. To be precise, the more student academic advisers the VET entrants have, the higher is the first semester GPA achieved. This is the case for Emily, who has one the highest GPA scores for the interviewee group and, also, the highest number of peer academic advisers. In contrast, the qualitative and quantitative data show that both Oliver and Emma have no peer whom they can rely on for academic advice for their assignments.

Another interviewee who has a relatively large number of peer academic advisers as well as extended networks of acquaintances and friends is Ava. She is the youngest of the interviewees, at 22 years of age. Ava moves to the university after switching from a completely different program at another university. Ava's program at the university also has a relatively large number of other VET entrants. The quantitative data indicates that the larger number of VET entrants makes the study environment more comfortable for Ava. Also, the quantitative path model suggests that her larger student networks aid both her social integration into the university and improves her performances.

The social atmosphere described by Ava seems very different to the environment described by Oliver, Emma and Emily. Ava explains about her close friendships in her first year:

*Interviewer* - And you've got five friends that you've identified as being close and also helping with your.....



Ava - They helped and they were good. I don't see them anymore but....they were pretty good....but I actually did so well in the third and second half of the second year that I was tutoring them.

Ava is helped by her close friends in the first year of studies and, it appears, the friends are then rewarded by receiving help from Ava in the later years. Ava continues to explain how the friendship group forms a close-knit study group:

*Interviewer* - Did [your close friends] help also in that first year I guess..?

Ava – Yes. Yeah... We did like study group sometimes. The thing was if we didn't understand an assignment or we struggled, we'd all do it together. I mean not cheat but we'd all sit down together and "how do you interpret it"... "I am having trouble with this", "what would you do" ....do you know what I mean, like.... cooperative study. I mean, there was a lot of.... and probably the last couple of years in [our program] there was a lot of stuff that was done for you and like we'd have to start up forums on the Internet... with the teachers like asking them "what does that even mean" and there'd be huge things ...like... them explaining to us what it was ....and students would be like "and what about this" and if you had a problem you would look at it and you'd see that that student had a problem with that as well...

Ava and her friendship group rely on each other for social and academic support. As a group, they participate in 'cooperative' study and able to communicate effectively with the academic staff. Ava gives the impression that the group is able to tackle and cope with the academic commitments in a cooperative and supportive atmosphere.

This atmosphere also seems to allow Ava to persist despite having first semester results that are not as high as some of the other interviewees and not as high as she achieves later in her degree. Her survey results also suggest that Ava perceives her performances as lower than she would like. It seems that Ava's results are at least in part due to issues with her home life:

So, I was always academic. But it was just between graduating and doing the middle part of uni... was a very bumpy part at home ....like my parents got divorced and I moved...

and that was really difficult because I had to move separately. I split up with my boyfriend of seven years halfway through uni.... and then yes. So it was very bumpy.

This 'bumpy period' at home seems to have been buffered with the help of her study group, whom Ava also relies on for social support. Ava finds comfort and support within her study group even through traditionally the most stressful academic periods:

Even for the exams, we'd have like study sessions together. We'd all bring food and we'd all go through the exams together... like I said... we'd all post on the computer to the teachers to give us an example of this... and that would help ....and people and other students living on campus would say this is what we found... go to here

While exam times might be associated with stress, Ava is able to dissolve the stress through her association with the group. She shares food while they study cooperatively. Having multiple members within a study group can be seen here to be highly effective for Ava. Not only is Ava more effective in getting help from lecturers and tutors, the numerous members of her study group are able to 'multiply' their personal networks to reach other student peer groups for help. In his investigations of student networks, Thomas (2000) has previously shown the influence of particularly central student network members in being able to connect to other student networks.

Another of the interviewees demonstrates that positive peer relationships are not restricted to the younger students. Lucas, the oldest of those interviewed at 55 years of age, not only socially integrates with his younger peers, but seems to be totally aware of the association between making friends with his peers and creating powerful academic study groups.

*Lucas* - I got the benefit of learning and taking the experience and I didn't just want to go out drinking with the kids when they partied. I still had to, to some extent, to become an accepted part of the role of working with groups. So I had to explain to my wife "look we've got to go out clubbing tonight... I'm going to have to go out and have a few drinks with the kids"

*Interviewer* - And you understood that was part of it?

*Lucas* - Well it was part of it. So they could understand and know more about me. So when it came to work together, we knew what we could rely on each other for.

Lucas appears to be in full control of his social interactions at the university. He realizes that there are sacrifices to be made, in terms of his other aspects of life. These sacrifices, Lucas understands, are later repaid, as he forms social connections which lead to effective working groups. Lucas is acutely aware of the connection between the social and academic aspects of being at university. He explains that his social interactions are a way to learn about the strengths of the peer group, to make them a more effective study unit.

In summary, the qualitative data not only support the quantitative analyses which indicate that positive peer relationships and student networks are important influences on the outcomes of these students, they also add nuanced information. Unfortunately at times, the university environment seems to promote student cliques that are essentially non-inclusive. Surprisingly, organisations like student associations that are in place to help social connectedness between students are at times inadvertently exacerbating social isolation for some of the VET entrants. The qualitative evidence supports the notions that peer friends and acquaintances are important as sources of not only social advice but are also needed to form student networks that can cooperatively tackle academic tasks.

## **9.4 Program Peer Group Size awareness**

The multilevel quantitative analysis suggests that Peer Group Size has an influence on the individual VET entrant students' persistence. The quantitative results suggest that as the Program Peer Group Size increases individual students' GPA and social integration have less of an influence on students' decisions to Drop Out. One crucial question is whether VET entrants are aware of Peer Group Sizes or at least have an awareness of the presence of other VET entrants within their own program year cohort. This information is examined using the qualitative analysis of the student interviews.

Ava, introduced in the previous section, is one student who is able to identify at least one other VET entrant. When questioned about the backgrounds of her peers, she identifies one student from within her student networks.

*Interviewer* - Did [your peers] have a similar background to you and coming from TAFE?

*Ava* – Well, one did an engineering degree, but she couldn't hack it because she broke up with her boyfriend. And that's when she dropped out. She, liked, failed everything and dropped out and then went and did [this program] because she owned horses and that.

Ava is thus in contact and studies together with at least one of her VET entrant peers. While her peer seems not to persist, Ava herself does with the help of her remaining friends. So, while it appears that Ava is not aware entirely about the other VET entrants in her program year cohort, she does take advantage and works cooperatively with one such student.

One other of the interviewees, Michael, identifies three of his VET peers and seems, on first impressions, to form a cooperative study group with them. When discussing his mature age, he states:

There were others in my age group. I got on well with the lads that I went to TAFE with. There was three of them that also started uni as well.....they were like ten years younger than me but I knew them well. And we used to help each other a lot. I'm the type of guy that likes to help people. And what I found when I went to university was ...no-one helps anyone. And you don't get taught anything...you teach yourself.....and that was the difference that I found between university and TAFE. At TAFE they actually teach you. In university, they dump the material in front of you ... you teach yourself.

Here Michael recognizes his VET peers and suggests that he can socialize with them and get some academic advice. But, in the second half of the quote and in other parts of his interview it is clear that Michael is not receiving as much help as he needed from his peers. In another quote Michael feelings of being different from most other students in his cohort is evident.

I would get insulted because of my age all the time. I would walk into a class and kids would say "are you the lecturer?" and I'd say "no, I'm a student". You could hear them talking in the background "what's he doing taking up a place here".

Interestingly, Michael identifies age within the student cohort as the point of difference. As noted previously, despite great amounts of effort, Michael eventually is not able to continue with his studies.

Another interviewee who also is not able to 'persist' sees the problem of not integrating into the university as being due to small Program Peer Group Sizes. When asked about her opinion of why VET entrants had more problems 'persisting' at university Emma's answer is quite poignant:

I think generally the students that go to [VET College] and get [VET] qualifications haven't done well in high school. It might not be every case. A lot of people I knew at [VET College] struggled at school or didn't do as well at school or had problems at school and they ended up at [VET College] at adult schools like [campus 1] and [campus 2]. So I think integrating into the university might be a bit harder because you do have all the high school students there's not as many adults and VET students

Emma's comment seems to emphasize some of the group dynamics that are brought out by the multilevel quantitative results. Her reasons given for VET entrants not (socially) 'integrating into the university' are that the university has 'all the high school students' and that 'there's not as many adults and VET students'. Emma describes quite accurately the actual demographics of the student population at this selective university explained in Chapter 1 (see page 15) and alluded to Michael in his previous quote. Emma, as Michael does, identifies with both VET students and adults. This notion is repeated by other interviewees, who, while unable to recognize other VET entrants, identified other mature aged students. James, for example, who enrolls into a program which includes a relatively large number of other VET entrants can only note the mature aged students. He notes that: "There were certainly much older people than me there.... in my classes as well. So it was noticeable".

Consequently, while some of the interviewees are not aware of their VET peers attending the same program lectures and tutorials, others are. VET entrants are at times associated with mature aged students who are generally more easily recognizable. In at least some cases, VET peers provide social and academic support to each other. It is not surprising that VET peers are not as recognizable at this university as VET entrant peer group sizes are generally smaller than

at other less selective universities. Thus, this low level of recognition of other VET entrants may simply be a result of the relative small VET entrant enrolment numbers.

Where VET entrants form larger groups, Milne, Glaisher and Keating (2006) reported that VET peers were the key academic source of advice for VET entrants and that in some cases VET entrants formed informal study groups. In this investigation, this is demonstrated by Ava, the youngest of the interviewees, who similarly notes that one of the members of her study group is also a VET entrant.

An alternative explanation for this low level of recognition, is that the groups are essentially invisible, as Kuh (2001) suggested, and that the membership to these groups is essentially an instinctive phenomenon. The interpreted feelings of comfort indicated by the multilevel analyses can be a result of increasing numbers of other VET entrants that are perceptible to the students only by the apparent increasing number of mature aged students. The sizes of these two groups may also be correlated, so that as a program accepts more VET entrants, it also accepts more mature aged students.

### Summary

This chapter, presenting the qualitative data collected from 10 semi-structured interviews, provides supportive evidence to the quantitative findings presented in Chapters 7 and 8. The qualitative analysis of the ten interviews results in 15 major themes (see Table 9.2) emerging from the coding of the interviews. Many of these themes are aligned to the notions represented in the Research Model (Figure 3.1). The chapter takes a focused approach and discusses qualitative evidence, in the form of interviewee quotes, supporting four aspects of the student attrition issue: (a) the multifaceted nature of the issue; (b) an exploration of the academic efficiency notion; (c) peer relationships and student networks; and (d) whether interviewees are aware of VET entrant 'Peer Groups'.

In reference to these four aspects, the qualitative evidence generally supports the quantitative analyses reported in previous chapters. In terms of the multifaceted nature of the issue, interviewees express the views that the decision to drop out of university is made for a multitude of reasons. The qualitative evidence, more so than the quantitative evidence, demonstrates how life is complex for all the students interviewed. Not only are university academic and social

integration at play but also external pressures from family and finances. In terms of the notion of Academic Efficiency, it appears that this variable, which combines the amount of effort a student needs to expend for the amount of perceived performance achieved, is important for the persistence of some of the interviewees. It seems clear that at least two of the five interviewees who withdrew, expended inordinate amounts of effort to achieve results with which they were not satisfied. While it is important to recognize that the interviewees are speaking on reflection and after the Drop Out event, the qualitative evidence suggests that the VET entrants consciously assess this Academic Efficiency notion on several occasions as they progress through their studies. VET entrants that have better control of their efforts in terms of perceived performance tend to not only perform well but also have more control over their persistence at university. Some of these students also make strategic adaptive changes to their lives in order to become more efficient in their studies. In terms of peer relationships, the qualitative evidence is seemingly clear. The interviewees who struggle to make working relationships with other students also struggle with their persistence. Some of the VET entrants feel very estranged from the other 'younger' students studying within the same program of study. In general, age seems more of a point of difference for the interviewees, which translates into viewing 'peer group sizes' in terms of number of mature aged students rather than other VET entrants. VET entrant peer groups may also be relatively invisible in this university where VET entrants are a very small minority group.

## 10 Discussion

A case is argued in Chapter 1, that there is a risk to students from disadvantaged backgrounds of dropping out from university studies. Reasons for dropping out from VET entry pathways, that have been designed to redress the 'disadvantage' balance, need special attention. A study like this present investigation can inform policies for transition support for such students while at university. The particular program peer group size effect identified in this investigation provides a basis for viewing any new groups attempting to establish themselves in a higher educational setting.

This final chapter is divided into four sections. Each of the first three sections address the three research questions stated in section 1.3. Namely, section 10.1 covers the factors influencing university student attrition or retention that are found for the VET entrants in this investigation, and how these factors interrelate. Section 10.2 addresses peer group size as a factor influencing student attrition or retention from the program level. Section 10.3 extends further the discussion from section 10.2 and considers the way that peer group size influences attrition or retention at the student level. Finally, section 10.4 focuses on the new issues related to knowledge aside from the peer group size effect already discussed, namely (a) the new biologically based framework for the factors of attrition, (b) the newly described and assessed construct of Academic Efficiency, and (c) the peer student network sizes.

### 10.1 VET entrant student level factors of attrition

The first of the research questions of this investigation asks what factors are influencing student attrition for the VET entrants at a specific Australian university that is highly regarded and long established. The investigation addresses this question using mainly the quantitative Mplus student level analyses, which indicate variables that directly and indirectly influence the student drop out decision for this group of students. The results are best summarised by viewing the final model, which presents the student level factors that are statistically significant and that are conceptually supported by the research model for this investigation. The final Mplus model, shown in Figure 7.2, shows how the factors interrelate. The Mplus analyses also indicate that there are more than 20 student level factors that have a role in the attrition or retention for these students.



Furthermore, the Mplus analyses indicate that there are three factors that directly influence the drop out decision: whether the student had received any Transfer Credit for their previous studies; a student's Grade Point Average (GPA); and Institutional Commitment.

### 10.1.1 The Transfer Credit path of influence

The first path of influence to be discussed indicates that if students receive some Transfer Credit during their first year of studies, they are less likely to decide to drop out. Transfer Credit (TC) is assessed in this investigation as occurring anytime in the first year of enrolment. In this period of enrolment, it is assumed that the amount of credit granted is seen to be less important as to whether it is received or not. Thus, Transfer Credit is recorded as a dichotomous variable (see Figure 6.32 on page 198) assessing whether the student has or has not received credit for their past VET studies.

The credit received for previous studies is a variable, which has often been addressed in Australian contexts. It is in this country where this notion has long been considered and taken into account, particularly in the Vocational Education and Training (VET) sector where students have had a formal process of recognising prior learning (RPL) (see Aird et al., 2010). In the 'competency based' VET system, students have the opportunity to demonstrate that they have acquired one or more of the 'competencies' covered by the VET course they are undertaking in previous learning situations and be granted credit for them.

While guidelines also exist for universities to grant appropriate amounts of transfer credit (Australian Qualifications Framework Council, 2011; Watson et al., 2013), universities are not under any obligation to follow these. The Transfer Credit for the undergraduate university programs, which are covered by this investigation, have often been determined by transfer pathway agreements between the VET colleges and the university (see Cram & Watson, 2008; Watson et al., 2013). However, whether the students receive credit or not often needs the student's impetus and understanding of the pathway agreements. As shown by past studies on the subject and by the qualitative evidence in this investigation Transfer Credit is not well understood by all VET entrants into the Australian university system (Byrnes et al., 2010). Despite having transfer agreements set in place, Australian universities also have generally lacked

systematic credit granting facilities (Aird et al., 2010; Harris & Rainey, 2012; Harvey & Szalkowicz, 2015; Jackson et al., 2011; Milne et al., 2006; Wheelahan & Moody, 2011).

Past studies in Australia have shown that Transfer Credit is not always viewed positively. In particular, students who receive large amounts of credit and begin their studies in the second year of an undergraduate degree and this is not the case in the university involved in this investigation, may have problems with adjusting to the rigours and independence of university studies (Keating et al., 2006; Watson, 2006). Academic staff have also been found to view Transfer Credit suspiciously as universities compete with each other to “fill up empty seats” (Milne et al., 2006). In general, these feelings may be magnified in Australian elite universities that have tended to have had the lowest levels of VET entrants (Watson et al., 2013).

Conversely, other studies have shown that credit is important in positively influencing student attrition (see Hassard, 2011). Transfer Credit has been found to be a direct predictor of persistence in at least one other Australian university context (Deng et al., 2007). A similar trend of better persistence among students receiving transfer credit has also been noted in US university contexts on the relatively rare occasions that it has been taken into account (DesJardins, Ahlburg, & McCall, 1999; Gillespie & Noble, 1992; Liu & Liu, 1999; Tharp, 1998).

The student level final model, shown in Figure 7.2, also records that Transfer Credit received is itself directly influenced by a student's VET Qualification Level (VETQ). Students with higher levels of VET qualification, whether a Diploma or Advanced Diploma, are more likely to receive Transfer Credit in their first year of enrolment. The finding that the VET Qualification Level has a direct effect on the Transfer Credit is not surprising. As students become more qualified, they are also more likely to receive credit through agreed pathway arrangements. Such students are also more likely to seek credit on their own accord for their completed higher level studies. VET Qualification Level also has a relatively large indirect positive effect on persistence mediated through Transfer Credit ( $\beta = -0.13$ ). Again this result is not unexpected, as students with higher past achievements and higher educational qualifications (see Grebennikov & Shah, 2012) have been found to persist in university contexts more than students with lower levels of achievement (see Astin & Oseguera, 2012; Lamb, Jackson, Walstab, & Huo, 2015; Marks, 2007).

Consequently, the findings in this investigation that Transfer Credit is a direct influence on the student Drop Out decision, and that Transfer Credit itself is influenced by the VET Qualification Level, are not entirely unexpected. The coverage in a university class, (for which a student needs to allocate time, effort and money) of already known material can be seen by students as wasteful (see Aird et al., 2010; Milne et al., 2006). This repetition of content can deter students, who may be older and who may not have extended periods of time available to continue in a course of study, which would thus take longer to complete. This can be viewed to be an inefficient use of the effort expended. This 'efficiency' aspect in university studies is discussed further in section 10.4 In terms of this group of students, their previous VET studies have provided opportunities to acquire knowledge that may be useful and overlap the content covered in their university courses. Receiving credit for these studies also acknowledges the student's prior achievements and may show such students that they are valued and recognized as individuals by the institution.

This investigation therefore indicates that Transfer Credit should be treated with considerable attention, as it is one of only three direct factors involving student attrition, and the magnitude of its effect is equal in strength to a student's GPA (both variables have a  $\beta$  value of -0.42 in the student level model shown in Figure 7.2), a variable whose effects are the next topic of discussion.

### 10.1.2 The Grade Point Average path of influence

A student's Grade Point Average has been found consistently to be a strong predictor of university student attrition (see Chapter 2). While Tinto (1975, 1993) included this variable within his notion of Academic Integration, in studies prior to Tinto's work and in more recent investigations it has been assessed as a variable in its own right (see discussion in section 2.3.2). Numerous studies have found GPA to be one factor, if not the most influential factor of university student attrition, particularly for students belonging to minority groups (Allen, 1999; Bean & Metzner, 1985; Cabrera, Nora, Terenzini, Pascarella, & Hagerdorn, 1999; Eimers & Pike, 1997; Fox, 1986; Hall, 1999; Nora, Cabrera, Hagerdorn, & Pascarella, 1996; Pantages & Creedon, 1978). Indeed if this variable is not accounted for in any examination of student attrition, the subsequent results now need to be taken with an element of caution. Australian quantitative studies on university student attrition have often omitted this variable, choosing to focus on pre-university performance markers such as the high school Australian Tertiary Academic Ranking (ATAR) score (see section 2.2) in an attempt to explain the Drop Out outcome at an earlier stage.

One large study surveying over 14,000 students across Australia has nevertheless confirmed the importance of first semester GPA as a strong predictor of first year student attrition (Coates & Ranson, 2011).

GPA's direct influence on the decision to Drop Out for the VET entrants in this investigation is thus not surprising. The results indicate that as students' GPAs rise, they have a better chance of persisting to their second year of university studies. This study, however, introduces three variables, that have not been investigated to any great extent, which directly influence GPA and that in turn indirectly influence the Drop Out decision: (a) Student Admit Semester (SEM); (b) Academic Efficiency (AE); and (c) the number of Peer Student Academic Advisers (SN3) used by VET entrants.

The first of these, Student Admit Semester (SEM), that is, whether students enter in the first and larger intake semester or in the second smaller intake semester of the year, has an unexpected direct effect on students' GPA's. As discussed in Chapter 1, this variable is not included in US government statistics and dismissed by many US academic studies focusing on attrition. Hagendorn (2012) accused US universities, in this respect of 'playing a numbers' game' by not reporting on Semester 2 entrants as they were generally lower ranked in comparison to Semester 1 entrants and thus more susceptible to dropping out. Hagendorn advocated the inclusion of Semester 2 entrants so as to assess institutional attrition more accurately. Past studies in Australian contexts have also not assessed this variable to any extent. Therefore, this investigation is one of the first to include this factor in its mathematical modelling of the student attrition issue. The results indicate that students who first enrol into Semester 2 statistically achieve a lower GPA than students who first enrol in Semester 1, when all other variables are controlled for.

In this investigation, qualitative evidence is also available from one of the interviewees who entered in Semester 2, and is discussed in Chapter 9. The student, Oliver, is very conscious of entering at a later stage than all the other students in his program of study and has difficulty in forming the student networks that are important to succeeding. He also encounters difficulties with the lecturing and administrative staff. Possibly, as a result of these circumstances, Oliver expresses feelings of isolation. Bennett (2003) in his investigation found a similar result for students who joined the undergraduate program late in a UK university. The variable 'Timing of

Enrolment' was included as a direct predictor of 'Academic Performance' in Bennett's (2003) final path model with a  $\beta$  coefficient of -0.21. This finding is of similar magnitude to the effect in this study for the Semester variable, which has a  $\beta$  value of -0.19.

The second direct predictor of GPA, Academic Efficiency (AE), is defined for the first time in this investigation. This variable has much in common with Pace's notion of 'quality of effort'. Pace (1982) described his 'effort' as being associated with notions of efficiency. He described different kinds of effort in an attempt to identify the most effective. However, an assessment of effort expended without any reference to any measured outcome made judgements about actual efficiencies rather indirect. In this investigation, Academic Efficiency provides an assessment of the amount of perceived levels of satisfactory performance using one unit of effort, as is indicated by survey items assessing both expended effort and achieved perceived performance. This way of assessing effort therefore provides a more direct way of comparing efforts expended by the students in order to achieve a specified outcome. The outcome chosen for the study is perceived achievement, as it is argued that if a student continues to obtain satisfactory levels of achievement they then persist.

The measure of Academic Efficiency, in this study, is indicated by the Mplus analyses to be the main explanatory variable of a student's GPA and also to have a significant indirect effect mediated through GPA on the student Drop Out. Thus, for this group of students, the more efficient they are with their efforts in gaining a satisfying level of achievement, the more likely they are of recording a higher GPA, and of persisting into their second year of studies.

Figure 7.3 records that Academic Efficiency is itself influenced by the Working Hours Per Week (WHPW), that is, by the number of hours that students work to supplement their income while studying during their first year of enrolment. This variable has been found to be a predictor of persistence and degree completion in past studies (Muldoon, 2009; Titus, 2004, 2006a). In this present investigation, the more nuanced results indicate that if students work, and work longer hours, they are more likely to be efficient with their studies. This efficiency in turn helps them to achieve higher grades. These quantitative findings seem to be supported by the qualitative findings in this investigation. At least two of the five students interviewed who persisted into their second year of studies express views that their outside work, while providing fewer hours to undertake their studies, is in some way helpful in the way they approach assessment tasks. This

relationship may be an indication that students who have needed efficiencies in their work situations can enhance efficiencies in effort when they are encountering academic situations. This relationship may explain some of the inconsistencies reported in past Australian studies. For example in an Australian study, McKenzie and Schweitzer (2001) could not reconcile their results showing that part-time students who worked full-time obtained higher GPAs than normal. Their findings are thus consistent with the quantitative and qualitative results found in this investigation that the number of hours worked per week while studying can positively influence how efficiently students undertake their studies, which then positively influences their grades at university.

The findings, shown in Figure 7.2, indicate that a student's GPA is directly influenced by a third variable, Peer Student Academic Advisers (SN3), that is, the number of peer student advisers that VET entrants have in their first year of studies. This variable is based on Thomas' (2000) notions of student network sizes. The theoretical underpinnings for the student network sizes assessed in this investigation extend these notions and focus on the biological implications of assessing the differences between smaller and larger groups. The notion of network sizes thus takes into account the principles of 'collective behaviour' as described by Sumpter (2006). These principles propose that as group sizes increase the achieved performance for the group and for the individual also increases. The Mplus analyses support these theorized relationships. As the number of Peer Student Academic Advisers increases for a student, so does the student's recorded GPA.

While the composition of students' social networks (see Swenson Goguen et al., 2010; Thomas, 2000) is quite possibly a confounding variable that cannot be investigated in this study, the results indicate that the number of peer students within the networks is also very influential on student performance and persistence, when 'numerical' minority students are involved. A past study focusing on the psychological notions of student adaptability and wellbeing found a similar result when assessing the effects of student social networks, which included friends and family as well as fellow students. Hays and Oxley (1986) found that out of all the variables assessed, the number of fellow students was the most strongly related variable to adaptation. They concluded that the larger networks offered a greater probability that a variety of supportive resources was available. The theoretical framework based on biological principles in this current investigation provides a biological and evolutionary perspective to this numerical advantage.

The finding that this numerical advantage is also a factor when considering minority student attrition is essentially logical, especially when considering the extreme case of a student having no peer to help solve problems. If a student has no other peer student to turn to for academic advice, they are more likely to achieve a lower grade than a student who has two, three, or more students who can provide academic assistance. The principles of collective behaviour propose that this assistance is beneficial for all students involved. As students receive assistance, they then reciprocate, resulting in a higher level of achievement for each student in the network than would otherwise be possible if fewer students were involved. These findings are supported by the qualitative evidence. At least three of the five students interviewed in this investigation who dropped out from their first year of studies have problems building student networks of academic support. These findings are examined further in the discussion of peer group sizes and their effects on the student Drop Out in section 10.2.

Thus, the finding that GPA is a direct explanatory variable of student drop out is not surprising and provides support for past studies in this field. However, the indirect effects of Semester, Academic Efficiency and the size of each student's peer student academic adviser network are assessed and indicated for the first time in an investigation of the university student attrition issue.

### 10.1.3 The Institutional Commitment path of influence

Like GPA, Institutional Commitment has been shown to be a predictor of student attrition in numerous studies since Summerskil's (1962) description of the concept in this context (Braxton et al., 2014; Braxton et al., 2004; Braxton et al., 1997; Robbins, Lauver, Le, Davis, & Langley, 2004). Often this construct's influence on the Drop Out decision has been assessed as being mediated through the notion of a student's 'intention to persist' (see discussion in section 2.3.3 and section 2.3.4). As this investigation is a type of 'autopsy study' (see section 1.5), where students recall attitudes and experiences in retrospect, the notion of 'intention to persist' cannot be assessed accurately and is left out of the research model for this study.

Institutional Commitment's direct influence on the decision to Drop Out is expected and supported by the Mplus analyses. The notion is assessed in this investigation using survey items, which have been used in other studies (Bers & Smith, 1991; Long et al., 2006; Nora & Cabrera, 1993; Pascarella & Terenzini, 1979; Torres, 2006). Institutional Commitment's internal construct reliability and validity are assessed in conjunction with a closely related notion of 'Institutional

Membership'. While closely related, the two constructs are assessed to be better represented in this investigation as separate notions, as indicated by the reliability and confirmatory factor analyses presented in section 5.3, and as they are shown in the research model, presented in Figure 3.1. The resulting analyses indicate that Institutional Membership, itself based on Hausmann et al's (2009) notion of 'sense of belonging', has a strong direct influence on Institutional Commitment and a strong indirect effect on the decision to Drop Out mediated through Institutional Commitment.

It is not surprising that as a student's feeling of membership to the university increases their commitment to the university also increases. As this Institutional Commitment rises the student is less likely to Drop Out from the university. These relationships between these two important notions and the Drop Out decision were also found when Hausmann et al (2009) assessed them in their investigation at a US college. Hausmann and her colleagues assessed the persistence of African Americans as a minority group in a predominately 'white' university. As mentioned above their study also included the notion of 'intention to persist', which mediated the effects from these two notions on Drop Out for the African American group.

In this investigation, the two notions covering the social interactions that students had during their first year of studies are found to have a direct influence on Institutional Membership. This study's reliability and confirmatory analysis of the Social Integration notion indicate that this construct is best represented by two correlated constructs: Social Integration with Peers and Social Integration with Staff. Hausmann and her colleagues also found this to be the case as they assessed 'Peer Group Interactions' and 'Faculty Group Interactions' as separate constructs. While Hausmann et al's analyses found that only the peer interactions had a significant effect, this investigation's Mplus analyses indicate both Social Integration with Peers and Social Integration with Staff have direct effects on Institutional Membership and indirect effects on Institutional Commitment and on the subsequent student Drop Out decision. Therefore, this investigation's results indicate that as VET entrants' social interactions with both peers and university staff at this university improves, they are more likely to feel like a member of the university. Social Integration's often encountered indirect effects on student Drop Out mediated through Institutional Membership and Institutional Commitment (Braxton et al., 2004) are thus supported in this investigation.



It is essential to consider the results of the HLM analyses at this stage of the discussion. The multilevel analyses performed using the HLM computer program have important strengths and weaknesses. One of the weaknesses is, as discussed in Chapter 8, that HLM cannot examine indirect effects on the student Drop Out outcome variable. One of HLM's strengths, however, is that it provides more appropriate estimations and therefore more meaningful estimates when variables from the program levels are involved in the analyses. Thus, when the program level variable Program Peer Group Size (P\_PGS) is introduced to the issue, Social Integration with Peers is shown to have a direct influence on the student Drop Out decision. In other words, the analyses, which include the program level variables, indicate that as students' interactions with their peers improve this has a direct positive effect on the persistence of the VET entrants. As are shown by the Mplus analyses, there seem also to be indirect effects through the Institutional Commitment path of influence. These direct and indirect effects of Social Integration with Peers on the student Drop Out decision were also indicated by initial trials with multilevel analyses using Mplus.

This study also finds that the Social Integration with Peers is itself directly influenced by four variables: the student's University Preference (UNIP); the Student's Study Load (FTR); the number of Peer Student Close Friends (SN2); and the number of Peer Student Social Advisers (SN4).

The first of the direct predictors of Social Integration with Peers, University Preference, has been investigated on numerous previous occasions. This relationship is one that is based on Tinto's model of college student attrition (see Figure 2.2). This variable has often been named Initial Institutional Commitment or Institutional Commitment 1 (as opposed to Institutional Commitment 2). A statistical relationship has been found between this variable and (subsequent) Institutional Commitment but less often with Social Integration (Berger & Braxton, 1998; Berger & Milem, 1999; Braxton, Vesper, & Hossler, 1995; Pascarella & Terenzini, 1983). However, as discussed in Chapter 2, Tinto's model has been less well supported for use with non-traditional students. This investigation finds that for the VET entrants at this university, University Preference has a direct effect on Social Integration with Peers ( $\beta$  coefficient of 0.26) and an indirect effect on Institutional Commitment through Social Integration (see Figure 7.2). Thus for this group of students, if they choose the university involved in this study as their first University Preference prior to enrolment,

the students are then more likely to have better social interactions with their peers, which then have positive influences on their commitment to the university.

Similar findings have been made in some quantitative studies on attrition in Australia. In an investigation assessing attrition in Australian universities from descriptive statistics published by the Department of Education, Gabb et al (2006) noted that students were more likely to move to a different course of study if they had not chosen it as their first preference. These authors did not however assess university preferences. In a larger study, Long et al (2006) found from their assessments of student attrition from surveying over 4,000 students in 14 universities that students who had not entered their first university preference were more likely to withdraw from their studies. However, as their method of analysis was logistic regression, they could not assess indirect effects and they could not assess how the different variables were interrelated. Thus, this investigation furthers the understanding of this issue and indicates that for this group of VET entrants, if they do not have the university attended as their first preference prior to entry, then they are more likely to record lower levels of Social Integration with Peers. The often reported effect on Institutional Commitment from University Preference in this investigation is thus an indirect effect through the social integration variables.

The Mplus results indicate the presence of two additional direct explanatory variables of whether students socially integrate with their peers: the size of the network of close friends (SN2) and the size of the network of peers providing social advice (SN4). These findings are not surprising but are assessed for the first time in this investigation. Thomas (2000) previously measured student network sizes but did not use them in his assessments of various predictors of university student persistence. This current investigation's results indicate that the more acquaintances and friends the VET entrants have, the more likely that the VET entrants are to have positive social interactions with their peers.

This study also finds that a student's Age has an indirect effect on Social Integration. The older the VET entrant, the more likely they are to study with a reduced load. This reduced Student Study Load (FTR) then negatively impacts on the students' integration with their peers. The results indicate that older VET entrants, who may have other commitments, are more likely to reduce their study load and possibly their time spent at the university. This reduced study load then prevents the older VET entrants from socially integrating with their peers. Student Study

Load is expected to have greater influence on student attrition (see Tharp 1998), but the final results indicate that, for this group of students, this variable has only a minor indirect effect on a student's decision to drop out when all other variables are statistically controlled by regression analyses.

Two variables are shown in the final student level model (Figure 7.2) that have indirect effects on both the Institutional Commitment and the students' GPA's: Financial Support (FS); and Peer Student Acquaintances (SN1). These two variables are seen to connect the otherwise two separate lines of influence. Regarding the first of these two connecting variables, if VET entrants receive some form of Financial Support (FS), this then has contrasting effects on the drop out decision depending on the path of influence. Along one path, there is a positive effect, as these students, receiving Financial Support, are then more likely to study full time, which then results in better social integration. As discussed earlier, students who have positive social interactions are more likely to consider that they 'belong' at the university, which then increases their likelihood of having a positive commitment to the university. However, the effects along the other path of influence is negative. The VET entrants, who receive some Financial Support, are also less likely to work more hours of outside work which in turn makes the students less efficient in their studies. As described earlier this lack of efficiency leads to lower student GPA scores. Thus, receiving financial support has both positive and negative indirect effects on student attrition for this group of students. However, the total, indirect, effects on the actual drop out decision from Financial Support are small as they are mediated through a number of other variables.

The number of student acquaintances (SN1) also has 'complimentary' indirect effects on the drop out decision through the two paths of influence. As the number of peer student acquaintances increases there are positive indirect effects on both Institutional Commitment and students' GPA's. This is mainly due to higher number of acquaintances resulting in larger peer student networks providing both social and academic advice. As discussed earlier, increasing the student network sizes (SN2, SN3, and SN4) has positive impacts on students' social integration and academic performances. Conversely, lower numbers of acquaintances have negative indirect effects on both social integration and students' academic performances.

In summary, this investigation's student level Mplus analyses have provided a number of new factors influencing student attrition for VET entrants to an Australian university. The single level

analyses have also presented a clearer picture of how the various factors influencing attrition interrelate.

#### 10.1.4 Variance explained

One final reference needs to be made about the amount of variance explained by the final Mplus model shown in Figure 7.2. The final model explains approximately 85 per cent of the variance for the Drop Out decision made by the VET entrants assessed in this study. This explanation of variance is higher than in any of the studies reviewed in Chapter 2. This large amount variance explained is an unanticipated result, as the investigation did not set out to assess all possible variables, instead focusing on peer group and student network sizes and their effects on the student attrition.

This large amount of variance explained is in part due to the use of statistical methods which provide a more accurate estimation of the dichotomous variable. As is discussed in Chapter 2, the studies that used less accurate techniques and assumed the Drop Out variable as continuous (see Braxton et al., 2014; Saeed, 2008) tended to report lower R square values of between 0.15 to 0.30, corresponding to 15 to 30 per cent of variance explained. In contrast, those studies that used LISREL and the Mplus computer programs (see Cabrera et al., 1993; Hausmann et al., 2009) which could take account of the dichotomous nature of the Drop Out variable, reported estimated variance explained values of up to 60 per cent. In this study a similar change in explanation of variance explained is noted when the same model is tested with the AMOS computer program, which treats Drop Out as continuous, and the Mplus computer program, which accounts for the dichotomous nature of the Drop Out variable. The Mplus analyses, reported in Chapter 7, invariably result in larger variance explained. This can be explained in that a sigmoid curve, resulting from logit or probit transformations used by LISREL and Mplus to model the dichotomous outcome values, can better plot the outcome values and can better provide estimates of variance from these. In other words it is much better to use a S shaped logistic curve to model a dichotomous variable than to use a straight line, such is used by multiple regression.

In addition, as discussed in Chapter 1, this study takes the opportunity of assessing the student attrition issue at a time when these VET entrant enrolment groups are rapidly increasing. The results tend to support the view that, at least for this group of students at this early stage of

pathway developments, the various interactions with peers are a powerful force in university student persistence (see also Schuetz, 2008; Thomas, 2000).

Part of this large amount of variance explained may also be due to this investigation's use of a theoretical basis that combines well-tested theoretical underpinnings from past studies with a new theoretical framework which takes into account a biological view of the decision making process. Because of this new theoretical basis, this investigation adds several variables that have not been tested within past models of university student attrition. These important aspects of this current investigation are discussed in the following sections of this chapter.

## **10.2 Program Peer Group Size: a factor influencing student attrition**

The second research question of this study asks whether VET entrant peer group sizes at the program level and at the faculty level are significant factors influencing student level attrition. In order to assess this relationship, this investigation argues that the data are nested within different levels of influence.

Educational data have been identified to be inherently multilevel in nature (Keeves & Sellin, 1997; Resnick, 2010). In this multilevel view, students, in this study, can be conceived to be nested within programs, and the programs themselves can be seen to be nested within faculties. Titus and several subsequent educational researchers have similarly assessed university student level data nested within universities at the institutional level (Franke, 2012; Oseguera & Rhee, 2009; Titus, 2004, 2006a, 2006b) and within university class level groups (Stewart et al., 2013). These researchers have assessed the influence of variables belonging to two levels in separate investigations (see section 2.3.6) using Hierarchical Linear Modeling (HLM) procedures, including Hierarchical Generalized Linear Modeling (HGLM), to identify variance at two levels of influence.

However, this investigation examines the influence of variables belonging to three levels of nesting. Conceptually this investigation can be viewed as extending previous multilevel studies on student attrition. Instead of class level, this investigation examines program level variables; and instead of institutional level, this study examines faculty level variables. Thus the case is made in this investigation that students in a particular program year cohort are more similar to each other

than they are to students in other program year cohorts. Similarly, students in faculty year cohorts are treated as more similar to each other than to students in other faculty year cohorts.

Thus, within this multilevel framework, VET entrants are grouped into their respective program year cohorts and faculty year cohorts to obtain values for Program Peer Group Sizes (P\_PGS) and Faculty Peer Group Sizes (F\_PGS). The influences of these Peer Group Sizes on the student level decision to Drop Out are then assessed using the HGLM procedures within the HLM software program.

The results of the HLM/HGLM analyses indicate that while VET entrant Faculty Peer Group Sizes are not explanatory variables, Program (level) Peer Group Sizes are explanatory for this group of students. Indeed, the analyses indicate that Program Peer Group Size is the only significant second level explanatory variable, over and above all other program level variables assessed in the study. This is an unanticipated finding.

A number of Australian studies have found the higher level 'field of study' as a predictor of student attrition (Coates & Ranson, 2011; Marks, 2007; J McMillan, 2005). A multilevel US study on student attrition examining influences from two levels found that the second level students' aggregated intentions to withdraw independently influenced student level persistence (Oseguera & Rhee, 2009). The results from these studies and logic indicate that if a program has a high attrition rate, or conversely a high retention rate then this may influence the student attrition and retention rates (see French, Immekus, & Oakes, 2005). The notion that 'everyone gets through that course' would suggest that irrespective of how a student fared within that course students would be able to persist, whether it was because of the ease of the material or the support that the teachers gave. Thus, in this investigation, the variable Program Peer Group Retention Rates (P\_ARR) was expected to have some degree of influence on student attrition. However, in this investigation, Program Peer Group Size is found to be more predictive of a student dropping out than the assessed Program Apparent Retention Rates (P\_ARR), which in the HLM analyses results as a non-significant variable for this group of students.

Therefore, while no significant relationship can be found for any of the faculty level variables, including faculty VET entrant peer group sizes, significant influences are found for program level

VET entrant peer group sizes. The variable Program Peer Group Size (P\_PGS) is found to have two significant moderating effects on student level Drop Out.

Peer group size has, in the past, been implied as a factor of student attrition. Oseguera (2005) deduced from past studies on student attrition that a critical mass of racially similar students with whom one spent time outside of the classroom created a safe environment for study. Kuh (2001) hypothesized that minority subcultures were at greater risk of attrition because members of such minority groups would find it difficult to find 'enclaves' from which to draw support and guidance. Kuh considered the possibility of college students belonging to two or more subgroups including groups that were essentially 'invisible' (Kuh, 2001, p. 26). This present investigation supports Oseguera's and Kuh's postulations. It provides quantitative empirical evidence to show that minority (VET entrant) group size increases the influence on the student level drop out decision, when all other significant variables assessed are statistically controlled.

Qualitative information is also presented to indicate that these groupings, as proposed by Kuh, are evident to some of the VET entrants but not to all. As discussed in section 9.4, some of the VET entrant interviewees identify themselves as being a part of a visible mature aged group of students, rather than the 'invisible' VET entrant group, within their program cohorts. Others, while identifying a few of the VET entrants in their respective program year cohorts, are not aware of how many VET entrants there are in total. This evidence indicates that the VET entrants and the mature aged students are either the same group or the variables within these groups were correlated. It must also be recognized that many of the 10 interviewees are older, which may have biased these perceptions.

There have, however, been numerous past studies on racial minority student attrition which, with the exception of Asian students, have consistently found that students within these groups tended to drop out at higher rates (Cabrera et al., 1999; Eimers & Pike, 1997; Pascarella, 1985; Seidman, 2005). Tinto (1987) suggested that such minorities were in some way academically underprepared with differences in abilities arising from prior educational experiences at elementary and secondary school levels where the educational achievement of and the persistence of non-minorities were favoured. Cabrera et al (1999) argued that simply raising the number of minority group students on campuses might have risked the rise of discrimination and racial tensions at these campuses. These arguments have been made within an environment

lacking empirical evidence that assessed differences that might have occurred as minority group sizes increased. In this present investigation, assessments are made within groups of students who are generally not racially discriminate, and thus group size effects are examined in a more controlled environment (that is in an environment having fewer confounding variables). The results from this investigation indicate that future studies on minority group attrition need to take into consideration actual numbers of students who make up these minority groups.

The group in question are students who enter the university on the basis of a complete VET qualification. Such students have been generally found to drop out at higher rates than the traditional high school graduates (Australian Government, 2004; Lamb et al., 2015; Long et al., 2006). But a study undertaken at Canberra University found this relationship to be reversed when VET entrants enrolled in greater numbers into programs with articulated VET and university courses (Cram & Watson, 2008). The researchers concluded that it was the careful articulation of curricula which was the main explanatory variable involved. Therefore, this study forwards an alternative explanation for these results. As VET entrant enrolments increase within any specific program there is a possible likelihood that persistence among the group improves irrespective of other variables.

This finding also supports the often reported view on majority groups and provides empirical evidence for a possible explanation, in part at least, why selective universities tend to have retention rates higher than other universities that may enrol a more diverse group of students. Highly selective universities tend to enrol traditional students the majority of whom can be considered as belonging to the same group. Thus, in this context, Peer Group Sizes are large.

It also provides empirical evidence to explain why minority groups within selective universities are at particular risk of attrition levels higher than the university norm, as any new group enrolling in any such university is placed in a numerical minority situation, which thus places it under the influences of Peer Group Size effects described in this study. For example, in one US study Berger and Milem (1999) found that being African American had a negative influence on persistence at a highly selective US university. At the same university the authors found that 'having liberal political views' had a negative influence on social integration. The empirical finding that a numerical minority was at least in part responsible for persistence and social integration thus provided a possible explanation for these reported findings for two contrastingly different



groups of students that were in a minority in this highly selective university. That is, in both cases these types of students were in a numerical minority in terms of Program Peer Group Sizes and were possibly influenced in the same way as the VET entrant groups are influenced in this study. The way numerical minorities, in terms of Program Peer Group Sizes, influence the central notions of persistence or attrition and social integration is discussed in the next section of this discussion.

### **10.3 The moderation effects of Program Peer Group Sizes**

The third and final research question of this investigation asks in what possible ways do program peer group sizes influence student level attrition for the VET entrants at this university. In order to address this final question the discussion turns once again to the multilevel HGLM analyses undertaken to assess the influences on the student level attrition outcome variable for this investigation. As the research model presented in Figure 3.1 shows, the HGLM analyses assessed two kinds of relationships coming from the second level variables: direct effects; and moderating effects on the student outcome variable Drop Out. Results of the analyses indicate that there are no direct effects, but that there are two significant moderating effects, both coming from Program Peer Group Size as a second level variable. These are shown in Figure 8.2 (on page 246).

The two moderating effects are:

1. There is a moderating effect as Peer Group Sizes increase on the effect of students' GPA on students' Drop Out
2. There is a moderating effect as Peer Group Sizes increase on the effect of students' Social Integration with Peers on students' Drop Out

In order to best demonstrate the effects, it is meaningful to examine the effects of both GPA and Social Integration with Peers without any moderating effects. As students' academic achievements, as assessed by their first semester GPA, improve the analyses indicate that the students are then more likely to persist into their second year of enrolment. This influence is a relatively strong one when no moderation effects are in place. Thus the better the students' GPA results, the more chance the students have of persisting. However when, comparatively speaking, the students are surrounded by a larger group of VET entrant peers, this strong effect

on persistence or attrition from GPA weakens. Thus, GPA itself becomes less effective on Drop Out and more students are able to persist than would otherwise be influenced by a low GPA result.

The same interpretation can be made for the Program Peer Group Size moderation effect on the relationship between Social Integration with Peers and student Drop Out. Therefore, when students are surrounded by a larger group of VET peers they are less likely to Drop Out from their first year studies because of low levels of social integration between themselves and other students. It appears that in both cases the larger number of VET entrants creates a kind of safe atmosphere for the VET entrants, where students who may have lower levels of academic achievement and have less social contact with their peers can still succeed.

In contrast, when Program Peer Group Sizes are small and there are relatively few other VET entrants in a program, this effect of GPA on persistence or attrition strengthens. In these situations, it becomes more important for the students to achieve higher GPA results and to make better social connections with peers. Thus, when VET entrant group sizes are small the highest achievers and those who can socially integrate successfully survive at greater rates to the second year of enrolment. The effect sizes of the two moderating effects presented in Figure 8.3 and Figure 8.4 indicate that the moderating effect is stronger on GPA than it is on Social Integration with Peers. Thus, when peer group sizes are small it is a student's academic achievement which becomes relatively more important. These claims are also supported by the qualitative findings in this investigation. Three of the five VET entrants interviewed who withdraw from their studies express feeling uncomfortable within their study environments while recognizing that they are different from other students. One of the three even switches to the online lecture content to avoid such situations.

These moderating effects seem to apply in other contexts. In a number of studies, majority group attrition has been compared to minority group attrition. If these peer group size effects were taking place, GPA would be expected to be a stronger predictor of minority retention than of majority group retention, since by definition the group sizes for the majority groups were larger than the group sizes for the minority groups. Indeed, a number of minority student attrition studies based in the US have indicated that students' GPA was a stronger predictor of persistence than it was for non-minority students (Allen, 1999; Fox, 1986; Grimes & Antworth, 1996). Hausman and

her colleagues (Hausmann et al., 2007; Hausmann et al., 2009) noted the differences and concluded that both GPA and peer support were more important for minority groups (African Americans) than for traditional majority groups (white students) at a predominately 'white' residential university in the US. In an earlier study, Pascarella (1985) concluded from his analyses that social integration was more influential for African American students than it was for white students. Pascarella analysed responses given in a longitudinal US country-wide survey and gathered data at student and institution levels. African American males were negatively influenced by the institution size. While Pascarella used less developed statistical techniques in his analyses, his conclusions were consistent with this investigation. He stated:

It may be particularly deleterious for campus minority groups such as black men. Because they are represented on the large campus in such small relative numbers, it may be especially difficult for such individuals to locate and join the types of peer subgroups that will enhance their individual integration into the institution's social environment (Pascarella, 1985, p. 368).

This current investigation refines these conclusions and places the peer group sizes at the program level of influence. Thus, as more VET entrants join a particular program within the university, there is less pressure for each of them to integrate socially with other students. In contrast, when fewer other VET entrants are enrolled within a program, socially integrating with other students becomes more important as to whether students drop out or not, for the relatively more 'isolated' VET entrants.

These results are also supported by two studies which found that feelings of comfort were very influential to persistence for minority groups. In the first study, Gloria et al (1999) assessed African American students' persistence at a predominantly white university: The authors found that comfort with the university environment and social support were the strongest predictors of persistence for this minority group. In a second study, Gloria (1997), who was concerned with high attrition rates recorded for female students of Latin American descent, termed as 'Latino Chicanas', assessed the influence of student feelings of comfort with the university environment at two contrasting US colleges. Gloria investigated these feelings at one university where whites were a minority and at a second university where whites were a majority. Results indicated that feelings of comfort with the college environment was more important where Latinos were in the minority. Results from both these studies support the notion that as minority student numbers increase, comfort levels improve and are therefore less important to persistence decisions.

Thus, results from this current investigation provide insight into the findings of other minority group attrition studies. In order to understand why such relationships occur, this current investigation relies on new theoretical underpinnings based on biological grounds. As this investigation is the first to introduce such theoretical grounds for the student attrition issue, it also allows for the examination of several new concepts within the overall framework. This new theoretical basis and the new variables involved within it are discussed in the next section of this chapter.

## **10.4 A new theoretical basis for university student attrition**

This investigation is taking the opportunity of using contemporary methods to be able to view the undergraduate student attrition or retention problem through a new theoretical perspective, namely one based on biological grounds. The use of statistical tools able to assess direct and indirect mediated influences from the student level factors and moderating influences from the program level factors provides a more detailed view of the issue, aligned with biological notions associated with the human collective behaviour, decision making processes and efficiency of effort.

This study investigates first year student attrition only. As dismissal on academic grounds can only occur during the second year of enrolment at this university, this study is therefore assessing only voluntary student withdrawal. Recent neural imaging of the human brain as it processes information while people make decisions has revealed new understandings on how the process takes place. As a student makes a decision to either persist or withdraw from their studies, the brain contends with emotional aspects and logical aspects of the decision differently. As Eagleman pointed out, these two aspects were processed through different parts of the brain, and the combination of the two were intrinsically connected so that the final decision by each student was the most advantageous for the individual student.

While further evidence from future studies is needed to support these notions, these two aspects of the 'Drop Out' decision, namely the emotional and the logical, can be viewed to overarch the variables found to be influential and represented in the student level final model of student attrition shown in Figure 7.2. The model can be divided into two sections: the upper part made up of primarily logical variables; and lower part made up of primarily emotional variables.

More specifically, the students; Grade Point Averages, whether they have received Transfer Credit, the students' Academic Efficiencies, the levels of VET Qualification, and the student network sizes which are providing academic advice are all variables that students' brains can process logically without substantial amounts of emotion. On the other hand, the variables that are primarily emotional in character are represented in the lower half of the model. These are: Social Integration with Peers; Social Integration with Staff, Institutional Membership; and Institutional Commitment. Student network sizes which are providing social advice and close friendships can also be considered as primarily emotional rather than logical in character.

This overarching emotional and logical divide suggests that each student inherently gathers all the emotional evidence and logical evidence prior to making a decision. Within the student's brain, the evidence is processed in combination before a final decision is made. Thus, for example, if a student receives low grades but does interact with his peers in a way that he feels that they are socially integrating, the two aspects counter each other and the student makes a decision taking both aspects into account. Eagleman (2015) suggested that this took place in the human brain by imagining separate futures and using a 'common currency' to compare the different possibilities. In this investigation, a possible common currency is introduced in the logical side of the framework.

Academic Efficiency is a new variable, and a possible logical common currency, that is proposed to record the amount of effort each student needs to expend in order to achieve acceptable academic results. More precisely the variable measures perceived achievement for each unit of effort expended. In this study, this variable is found to have the strongest influence of the variables tested on actual performance and a significant indirect effect on the Drop Out decision. This result provides initial support for the new theoretical framework proposed and is based on biological grounds. Within the Academic Efficiency variable, effort is assessed mainly as the notion of time spent and is thus a logical notion. Interestingly in the student interviews evidence arises that emotional effort is also a possible variable. However, this different notion is not assessed quantitatively, but is a possible topic for further research. Nevertheless, the notion of Academic Efficiency has combined effort with a perceived performance outcome in a new way so as to directly assess study efficiencies.

In the past, effort, in terms of time spent, has been included as a component of the Tinto concept of Academic Integration (Pascarella & Chapman, 1983a). Pace (1982), as previously discussed, tied different kinds of effort to different study efficiencies. But, in order to measure directly study efficiencies, effort is combined with an assessment of each student's perceived performance. The Academic Efficiency variable, assessed in this manner, can also assess if too much effort is expended. The quantitative evidence, supported by qualitative evidence obtained from two of the interviewees, indicates that if VET entrants expend inordinate amounts of effort to achieve their results, they are more likely to achieve lower grades and are less likely to persist. Moreover, one interviewee while discussing the extraordinary effort he expended to complete the assigned tasks expresses that he 'projected' the amount of effort needed over the length of the degree and then decided to drop out. Eagleman (2015) proposed that decisions were made in the brain using a 'common currency' to choose the best option or future in the same way by projecting or imagining different scenarios. Thus, Academic Efficiency seems to be acting as a common currency as Eagleman proposed for at least one of the VET entrants interviewed, and quantitatively, it is found to have an indirect influence on the decision to persist. It is up to future studies to reassess this new variable, to ascertain whether it can be of influence in other contexts.

The biological notions of how the brain processes data to make an informed decision are also associated with the notions of collective behaviour. These notions hypothesize that students need to be part of a student network of a critical size that aids in achieving the best result for each of its members. Thus, within the overarching model shown in Figure 3.1, Sumpter's (2006) notions of collective behaviour underpin the student network and Peer Group Size variables and how they interrelate to influence student attrition for this group of VET entrants. Pascarella's statement above (1985, p. 368) introduced the concept of a set of 'peer subgroups' in a university that aids students with their social integration and eventual persistence. While Pascarella did not extend his concepts to that of peer subgroup sizes, this current investigation takes the opportunity to do so.

As described previously, Thomas (2000) conceived various student networks but focused on their compositions rather than their sizes. Conversely, this current study conceives four separate student peer network groups and focuses on group sizes. The largest of these are the number of acquaintances each VET entrant has during the first year of enrolment. Within this group, the study defines three other subgroups: close friends; social advisers; and academic advisers.

According to the notions of collective behaviour advanced by Sumpter (2006), the larger the group sizes, the better the performance outcome for all individuals involved. This notion presupposed that humans were social animals who needed each other to survive. In evolutionary terms, and as Eagleman pointed out, human brains have been selectively 'hardwired' to ensure that humans worked in groups. This current investigation provides empirical support for these hypotheses. In general, and not altogether unsurprisingly, the results of the Mplus analyses indicate that as the student network sizes increase there is a positive influence on student persistence at university. These influences are indirect through both the logical and emotional sides of the model. Indeed peer group sizes, assessed at the program level, in the HGLM multilevel analyses, are also shown to influence positively both sides of the emotional and logical divide. As discussed earlier in this chapter, the HGLM analyses indicate that as Program Peer Group Sizes increase there is a moderating effect on the logical and emotional variables (GPA and Social Integration with Peers respectively), buffering the effects these variables have on student Drop Out, so as to allow more students to persist.

Therefore, the quantitative and qualitative analyses show that, for this group of VET entrants, peer group sizes are very much a central factor in the student attrition models obtained. Both student network sizes as perceived by the individual students, and the peer group sizes assessed at the program level have influences over the emotional and logical side of the decision making process. Students are making decisions to either drop out or persist while taking into account, consciously or otherwise, how many peers are around them and how many are helping them to achieve academically and socially within their programs of study.

# 11 Summary, Conclusions, Implications and Further Research

## 11.1.1 Summary and conclusions

This study investigates why students who have entered through Vocational Education and Training (VET) entry pathways decide to Drop Out from a selective Australian university. The topic is of particular importance at the time of writing. The current Australian conservative Government has cut base funding to Australian universities and has focused on the sustainability of government supported university enrolments. This has resulted in Australian universities focusing attention on ways of reducing costs and increasing income. Student attrition from university has been used as a key indicator of the economic efficiency of universities. When students Drop Out in their first year of studies, universities not only lose the income generated from the students continuing to study but also the money spent to attract the students in the first instance. Student attrition is also important to the Government, as the money invested to support such students can be considered to have been wasted. This issue becomes even more important when students from disadvantaged backgrounds decide to drop out, as in many cases extra funding is provided for such students to attend university. Most importantly, when students decide to drop out from their undergraduate university programs, they forfeit their time, effort, money and their opportunity to gain a qualification. If these students come from a disadvantaged background, they risk exacerbating their disadvantage.

This investigation takes the opportunity of examining the student attrition problem within a specific group of students, VET entrants, at a time when many new VET entry pathways are established at the university involved in the study, and attrition rates within the group fluctuate substantially. The study concentrates on group sizes as a set of variables of particular interest and poses its research questions to examine if there are any relationships between enrolment VET peer group sizes and attrition while accounting for other significant variables.

This study uses a data set that includes a large set of variables to assess the VET entrant student drop out problem at the university involved. The students who enter the university undergraduate programs through VET entry pathways between 2005 and 2012 are surveyed. In total, 140 VET



entrants (out of a population of 511) respond to the survey developed for the study. Primary data collected from the survey are added to secondary data collected from university and state admission centre records. The extensive set of variables generated from this data collection process is analysed using statistical procedures that can accurately assess and apportion effect sizes coming from direct and indirect influences from the student level variables and from direct and moderating influences from the program level and faculty level variables on the 'Drop Out' outcome variable.

The study makes use of several statistical computer programs to analyse the data. SPSS and AMOS are used to undertake reliability analyses and Confirmatory Factor Analyses on the latent variables assessed using the survey items. SPSS is used to produce the set of descriptive statistics for all the variables involved in the study. Mplus is employed to generate a student level path model incorporating both latent and manifest variables that are statistically significant. The HGLM functions within the HLM program are used to generate a two level model which includes significant moderating influences coming from Program Peer Group Size, a variable that is of particular interest to this investigation.

The student level Mplus model generated in this study includes over 20 variables that have statistically significant influences. Three significant direct influences on student Drop Out are found: (1) from the students' commitment to being at the university involved, as assessed by the 'Institutional Commitment' latent variable; (2) from the students' first semester Grade Point Average (GPA) results; and (3) from whether or not the students receive any Transfer Credit in the first year of studies. The strongest indirect influence on Drop Out is assessed to come from the students' feelings of belonging, as assessed by the 'Institutional Membership' latent variable. The estimated variance explained by the Mplus model is assessed as a relatively high 85 per cent of the total variance. One variable, Academic Efficiency, is developed for this investigation to measure the amount of effort VET entrants use to obtain perceived performance levels in their first year of studies. This variable is assessed as having the strongest direct influence, of the variables tested, on students' first semester GPA results and as having a significant indirect influence on the student Drop Out outcome through the GPA variable.

The program level Program Peer Group Size is assessed as having significant moderating effects on the slopes of two of the three student level significant explanatory variables found by the

multilevel HGLM analyses. The direct effects of GPA and 'Social Integration with Peers', identified by the multilevel analyses, are moderated by the program level Program Peer Group Size. The results indicate that as the number of VET entrants within any particular program year cohort increases, the VET entrants are less likely to decide to Drop Out, regardless of their first semester academic performances and of their capabilities to integrate socially with their peers. Conversely, when VET entrant peer group sizes are small, individual student academic performances and the capability to socially integrate become more influential to the Drop Out outcome.

In order to support the quantitative analyses undertaken on the numerical data, 10 of the VET entrants, from the survey respondents, are interviewed. The interviews are transcribed and a thematic analysis is undertaken on the resulting transcripts with the assistance of the Nvivo computer software program. The results of this qualitative analysis extend the understandings indicated by the quantitative findings and provide some emerging themes associated with the student Drop Out problem. In particular, supporting evidence is found for the notion of Academic Efficiency. VET entrants that are both very efficient and less efficient with their studies are documented. The more efficient students appear to be in much greater control of their performances than their less efficient counterparts. The evidence from the transcripts also suggests that many of the interviewees are not aware of the size of the VET entrant peer group within their programs. The Program Peer Group Size variable, which assesses these sizes, can be interpreted as an 'invisible' variable or one that is closely associated with the more 'visible' mature aged entrant group. The interviews also confirm the importance of the various student networks assessed in this study. VET entrants express the need for having other student peers to aid their academic performances and their social integration within the university.

Of major importance to this field of study is the development of a new theoretical framework for university student attrition. The framework developed for this study includes sociological and psychological notions, established in past studies, combined with new biological notions of how human beings decide when faced with unfamiliar situations. When making decisions, emotional and logical aspects of the issue are processed within different parts of the human brain. Variables within the path models developed for this investigation are thus associated with either logical or emotional aspects of the Drop Out decision.

Within this new theoretical framework, it is hypothesized that the decision making process is aided by a 'common currency' variable. Humans use this variable to assess whether their actions are 'worthwhile'. In this investigation, a logical common currency variable is proposed, advanced and employed, namely the aforementioned Academic Efficiency variable. The results in this study indicate that, in order to make decisions of whether to stay at university, students constantly assess the efforts that they expend in order to achieve acceptable results.

The importance of Student Network Sizes and Program Peer Group Sizes hypothesized by the research model and found by the analyses are also connected to the biological underpinnings of the student attrition model. The evolutionary notions of collective human behaviour propose that humans, as social animals, perform and survive better if they are part of a group. As the group becomes larger, the more likely the individual, within these bigger groups, is to succeed and survive in unfamiliar situations.

A related problem which can therefore be addressed in this study is the introduction of any new minority group within a majority group setting. The evidence from this study indicates that minority group students need the presence of others like themselves to persist and continue to their second year of university studies. In the absence of larger peer group sizes, it is the better performing minority group students who can better persist through the first year of university studies. In terms of VET entry pathways, the evidence from this investigation suggests that the most used VET pathways are the ones that are more likely to have students persist to the second year of studies. For individual VET entrants, it is also important for universities to acknowledge previous studies with Transfer Credit, making the gaining of an undergraduate qualification a much more efficient undertaking for the VET entrants involved. If these factors are not considered, attrition rates within these minority groups are likely to be greater.

Lastly, this investigation has demonstrated the power of using advanced methods to study university student level attrition or retention. Methods, such as those used in this investigation, which account for the multilevel and multivariate nature of the student attrition problem, are essential when assessing the multitude of variables involved. It is only by using such methods that a more complete picture of the issue can be explored and examined. This is particularly important in Australia where, as yet, very few advanced studies have been undertaken on the university student attrition or retention issue. These can provide sound empirical evidence to

validate and verify the advancement of educational policies and to monitor progress after changes are made.

### 11.1.2 Possible implications and further research

This investigation produces a number of new understandings into the problem of university student attrition and retention. Specific university policies can be suggested by simply viewing the estimated path models shown in Figure 7.2 and Figure 8.2. The importance of Transfer Credit, is one example already mentioned in this final chapter. The results obtained from the student level analyses imply that if students receive Transfer Credit for university program content that has been covered in the student's prior studies, they are then less likely to drop out in their first year of studies. While universities may look at this implication initially as a cost, due to the loss of income resulting from a truncated course, some, if not all, of this initial cost may be regained when a student persists past their first year of studies. In this case, students who have been acknowledged fairly might attract other students through word of mouth and through student satisfaction surveys that might even improve university rankings (see Hagedorn, 2012).

The importance of students' performances have also been emphasized in this investigation. While this is not a new finding, there are several explanatory variables of academic performance which may give rise to policy implications. Of note, informal student study groups would seem to be important for not only VET entrants, but for all students (see Keating et al., 2006; Milne et al., 2006). Facilitating the formation of such groups would benefit both students and the university. Mentor programs are undoubtedly useful, but the results suggest that it is beneficial for students to have a larger group of peers to support them through their first year of studies. Having dedicated areas available within the university where such groups can gather may be one way of dealing with this notion.

In order to improve a student's Academic Efficiency, the results also suggest that it may be beneficial for students to take some kind of paid employment during this first year of studies. While a number of studies have shown detrimental effects of working full time while studying (Coates & Ranson, 2011; Hillman, 2005; Milne et al., 2006), other studies have indicated that working part-time was beneficial for the university student (Bean & Metzner; Bers & Smith, 1991; Muldoon, 2009). This current investigation indicates that such work results in a more efficient student, possibly negating any negative effects from time lost away from studies. Other studies

have shown that work within the student's own university is particularly beneficial (DesJardins et al., 1999; Nora et al., 1996). This investigation supports these claims and university policies can allow for students to be preferentially employed in many situations.

While Institutional Commitment is an obvious factor influencing attrition and retention, the explanatory variable assessed as having the strongest indirect influence on retention, through Institutional Commitment, in this investigation is Institutional Membership. The feeling of being a member and that a student belongs to the specific university has a strong indirect influence on student persistence. Hausmann et al (2009) also showed that interventions to improve these feelings among students can be effective in improving student persistence. Therefore, any policies that set out to improve a student's feeling of belonging are supported by the findings of this investigation. A free or discounted coffee mug with a university logo for every student can go a long way to improve feelings of membership. These findings also suggest that university contact with individual students at risk and advising personal student options as suggested by Seidman (2012) may help foster students' feelings of membership and indicate that the university is committed to its students.

Student social interactions with staff and in particular with other students is vital for all students but in particular for students who may be part of a minority group. A focus is needed not only on racial minorities but also on minority enrolment groups. Students joining the university for the first time in the smaller second semester intake are at particular risk. The findings in this investigation add further nuances to past conclusions regarding lower persistence rates for second semester entrants. While Hagendorn (2012) suggested that it was second semester entrants' lower academic abilities that were the main influence for the higher attrition rates of this group of students, this current investigation, which statistically controls for other variables, indicates the possibility of another variable exerting influence on attrition. It may be that it is the lower enrolment number of students entering at the same time that puts second semester entrants in a numerical minority situation which then creates an environment that is less conducive to persistence. The qualitative evidence from this study suggests that student organisations which have intentions of improving student social integration can actually have the opposite effect if these associations are not inclusive of such minority students.

The findings of the Program Peer Group Size effect has some interesting implications for the introduction of any new entry pathways within a university environment. The results suggest that when pathways are first established, the better academically performing students are more likely to persist to their second year of studies, particularly when peer group sizes are small. Allowing students with higher level VET qualifications to be the first entrants may help control the naturally high attrition rates associated with small entrant group sizes. As numbers increase, the lower level entrants are then more likely to feel more comfortable being surrounded by other VET entrants and therefore are less likely to succumb to pressures from being socially isolated and or having fewer peers for academic support purposes. Unfortunately at present such policies may also not resolve issues in the short term with widening university participation for students from low SES backgrounds or those from disadvantaged backgrounds, as these groups are also underrepresented at the higher VET level studies (see Wheelahan, 2009).

Some educational policy researchers have suggested that universities should not attempt to develop pathways for every program, but should concentrate on those pathways, which attracted the most students (Laurente & Pailthorp, 2002; Wheelahan & Moody, 2011). These pathways have been described as 'short and fat' (Wheelahan & Moody, 2011, p. 22), as they usually involved movement of a larger number of students between geographically close institutions. This current investigation therefore supports these policy suggestions and provides a framework why such pathways may naturally have better persisting entrants. These, 'short and fat' pathways are particularly important if VET pathways are to provide equitable access, in the shorter term, for disadvantaged groups to higher education, and particularly to selective universities, where there are few minority students present.

One final implication involves selective universities. The theoretical framework used in this study suggests that selective universities that tend to enrol traditional high school leavers are naturally less prone to having student attrition problems. Often university attrition rates are used as an indicator of university rank and of quality (see Hagedorn, 2012). The findings in this current investigation suggest that unless minority peer group sizes are statistically controlled using appropriate analyses that account for mediating and moderating effects in a multilevel approach to the situation, universities which may accept a wider range of students including those from disadvantaged backgrounds may appear to be of lesser quality whether or not this the case. Thus, this current investigation supports the use of statistical modelling techniques where all

factors can be considered to help resolve such issues using multilevel analytical procedures together with moderation and mediation effects in a causal path model.

Further research on student attrition needs to include methods of investigation which are able to apportion effects according to the different levels of influence and that take into account both direct and indirect effects on student level attrition and retention. Also, as this study advances a student attrition model which includes previously undescribed variables within a new theoretical framework involving biological principles and notions, it would be advisable to extend and employ these variables and develop the theoretical grounds for studies involving other contexts to make the findings more generalizable. Future studies can undoubtedly uncover more nuanced relationships as statistical modelling techniques improve and more educational researchers make use of these powerful new ways of investigation.

# 12 References

- Aird, R., Miller, E., Van Megen, K., & Buys, L. (2010). Issues for students navigating alternative pathways to higher education: barriers, access and equity. A literature review prepared for the adult learner social inclusion project. Retrieved October 18, 2012, from [http://www.bridgetostudy.com.au/about/AdultLearnerLitReview\\_5%20July%202010\\_FINAL.pdf](http://www.bridgetostudy.com.au/about/AdultLearnerLitReview_5%20July%202010_FINAL.pdf)
- Aitken, N. D. (1982). College student performance, satisfaction and retention: specification and estimation of a structural model. *The Journal of Higher Education*, 53(1), 32-50. doi: 10.2307/1981537
- Ajzen, I. (1991). The theory of planned behaviour. *Organisational behaviour and human decision processes*, 50, 179-211. doi: 10.1016/0749-5978(91)90020-t
- Allen, D. (1999). Desire to finish college: an empirical link between motivation and persistence. *Research in higher education*, 40(4), 461-485.
- Arbuckle, J. L. (2011). *IBM SPSS Amos 20 user's guide*. Retrieved from [ftp://public.dhe.ibm.com/software/analytics/spss/documentation/amos/20.0/en/Manuals/IBM\\_SPSS\\_Amos\\_User\\_Guide.pdf](ftp://public.dhe.ibm.com/software/analytics/spss/documentation/amos/20.0/en/Manuals/IBM_SPSS_Amos_User_Guide.pdf)
- Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 user's guide*. Chicago, Illinois: SPSS.
- Astin, A. W., & Oseguera, L. (2012). Pre-college and institutional influences on degree attainment. In A. Seidman (Ed.), *College student retention: formula for student success* (2nd ed., pp. 119-146). Lanham, Maryland: Rowman & Littlefield.
- Australian Government. (2004). *Higher education attrition rates 1994-2002: a brief review*. (Research Note no. 1).
- Australian Government. (2014a). *2013 appendix 4 – attrition, success and retention*. (D14/383033). Department of Education Retrieved from <https://docs.education.gov.au/node/35983>.
- Australian Government. (2014b). *2013 appendix 5 - equity performance data*. (D14/691852). Department of Education and Training Retrieved from <https://docs.education.gov.au/node/36589>.
- Australian Qualifications Framework Council. (2011). Australian Qualifications Framework. First. Retrieved March 10, 2012, from <http://www.aqf.edu.au/>
- Australian Qualifications Frameworks Council. (2013). *The Australian education system*. Retrieved from <http://www.aqf.edu.au/wp-content/uploads/2013/02/Australian-education-system.pdf>.
- Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: Freeman.
- Bean, J. P. (1982). Student attrition, intentions, and confidence: interaction effects in a path model. *Research in higher education*, 17(4), 291-320. doi: 10.1007/bf00977899
- Bean, J. P. (1985). Interaction effects based on class level in an explanatory model of college student dropout syndrome. *American educational research journal*, 22(1), 35-64. doi: 10.3102/00028312022001035
- Bean, J. P. (1990). Why students leave: insights from research. In D. Hossler & J. P. Bean (Eds.), *The strategic management of college enrolments*. San Francisco: Jossey-Bass.
- Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of educational research*, 55(4), 485-540. doi: 10.3102/00346543055004485
- Bennett, R. (2003). Determinants of undergraduate student drop out rates in a university business studies department. *Journal of Further and Higher Education*, 27(2), 123-141. doi: 10.1080/030987703200065154
- Bentler, P. M., & Speckart, G. (1981). Attitudes "cause" behaviors: a structural equation analysis. *Journal of personality and social psychology*, 40(2), 226-238. doi: 10.1037/0022-3514.40.2.226
- Berger, J. B., & Braxton, J. M. (1998). Revising Tinto's interactionist theory of student departure through theory elaboration: examining the role of organisational attributes in the persistence process. *Research in higher education*, 39(2), 103-119.
- Berger, J. B., & Milem, J. F. (1999). The role of student involvement and perceptions of integration in a causal model of student persistence. *Research in higher education*, 40(6), 641-664.
- Berger, J. B., & Milem, J. F. (2000). Organisational behavior in higher education and student outcomes. In J. C. Smart (Ed.), *Higher education: handbook of theory and research* (Vol. 15, pp. 268-338). New York: Agathon Press.
- Berger, J. B., Ramirez, G. B., & Lyons, S. (2012). Past to present: a historical look at retention. In A. Seidman (Ed.), *College student retention: formula for student success* (2nd ed., pp. 7-34). Lanham, Maryland: Rowman & Littlefield.
- Bers, T. H., & Smith, K. E. (1991). Persistence of community college students: the influence of student intent and academic and social integration. *Research in higher education*, 32(5), 539-556. doi: 10.1007/BF00992627
- Blacker, J., Paez, D., Jackson, A., Byrnes, J., & Dwyer, C. (2011). Student transition: the critical element in VET to HE articulation. Retrieved October 18, 2012, from <http://3darticulation.com.au/wp-content/uploads/06-Student-Transition-Factors5.pdf>



- Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). Review of Australian higher education: final report. Canberra, ACT: Department of Education, Employment and Workplace Relations.
- Braxton, J. M., Doyle, W. R., Hartley III, H. V., Hirschy, A. S., Jones, W. A., & McLendon, M. K. (2014). *Rethinking college student retention*. San Francisco, CA: Jossey-Bass.
- Braxton, J. M., & Hirschy, A. S. (2004). Reconceptualizing antecedents of social integration in student departure. In H. Eggins (Ed.), *Retention and student success in higher education*. Berkshire, UK: Open University Press.
- Braxton, J. M., Hirschy, A. S., & McClendon, S. A. (2004). Understanding and reducing college student departure. In A. J. Kezar (Ed.), (Vol. 30): ASHE-ERIC Higher Education Report.
- Braxton, J. M., Milem, J. F., & Sullivan, A. S. (2000). The influence of active learning on the college student departure process: toward a revision of Tinto's theory. *The Journal of Higher Education*, 71(5), 569-590. doi: 10.2307/2649260
- Braxton, J. M., Sullivan, A. S., & Johnson, R. M. (1997). Appraising Tinto's theory of college student departure. In J. C. Smart (Ed.), *Higher education: handbook of theory and research* (Vol. 12, pp. 107-164). New York: Agathon Press.
- Braxton, J. M., Vesper, N., & Hossler, D. (1995). Expectations for college and student persistence. *Research in higher education*, 36(5), 595-611. doi: 10.1007/bf02208833
- Brunsdon, V., Davies, M., Shevlin, M., & Bracken, M. (2008). Why do HE students drop out? A test of Tinto's model. *Journal of Further and Higher Education*, 24(3), 301-310. doi: 10.1080/030987700750022244
- Byrne, B. M. (2010). *Structural equation modeling with AMOS: basic concepts, applications, and programming* (2nd ed.). New York: Routledge.
- Byrne, B. M. (2012). *Structural equation modeling with Mplus: basic concepts, applications, and programming*. New York: Routledge.
- Byrnes, J., Beaumont, P., Paez, D., Jackson, A., Blacker, J., & Dwyer, C. (2010). Student awareness of articulation and credit transfer in Queensland: results of a web-based survey. Retrieved 1 November, 2012, from [http://3darticulation.com.au/wp-content/uploads/Student\\_Awareness\\_Final\\_Sept\\_2011.pdf](http://3darticulation.com.au/wp-content/uploads/Student_Awareness_Final_Sept_2011.pdf)
- Byrnes, J., Paez, D., Jackson, A., Dwyer, C., & Blacker, J. (2011). Literature review of the integrated articulation and credit transfer project. Retrieved October 15, 2012, from <http://3darticulation.com.au/wp-content/uploads/Lit-Review-Final-2011.pdf>
- Cabrera, A. F., Castaneda, M. B., Nora, A., & Hengstler, D. (1992). The convergence between two theories of college persistence. *The Journal of Higher Education*, 63(2), 143-164. doi: 10.2307/1982157
- Cabrera, A. F., Nora, A., & Castaneda, M. B. (1992). The role of finances in the persistence process: a structural model. *Research in higher education*, 33(5), 571-592. doi: 10.1007/bf00973759
- Cabrera, A. F., Nora, A., & Castaneda, M. B. (1993). College persistence: structural equations modeling test of an integrated model of student retention. *The Journal of Higher Education*, 64(2), 123-139. doi: 10.2307/2960026
- Cabrera, A. F., Nora, A., Terenzini, P. T., Pascarella, E. T., & Hagerdorn, L. S. (1999). Campus racial climate and the adjustment of students: a comparison between white students and African-American students. *The Journal of Higher Education*, 70(2), 134-160. doi: 10.2307/2649125
- Carter, D. F. (2006). Key issues in the persistence of underrepresented minority students. *New directions for institutional research*, 2006(130), 33-46. doi: 10.1002/ir.178
- Chang, M. J. (1999). Does racial diversity matter? The educational impact of a racially diverse undergraduate population. *Journal of college student development*, 40(4), 377-395.
- Charles Darwin University. (2012). Student portal: credit transfer and pathways. Retrieved November 27, 2012, from <http://www.cdu.edu.au/studentportal/credit-transfer-pathway.html>
- Chiocchio, F., & Essiembre, H. (2009). Cohesion and performance: a meta-analytic review of disparities between project teams, production teams, and service teams. *Small Group research*, 40(4), 382-420. doi: 10.46496409335103
- Coates, H. (2010). Development of the Australasian survey of student engagement (AUSSE). *Higher Education*, 60(1), 1-17. doi: 10.1007/s10734-009-9281-2
- Coates, H., & Ranson, L. (2011). Dropout DNA, and the genetics of effective support AUSSE Research Briefings (Vol. 11). Camberwell, Victoria: Australasian Survey of Student Engagement.
- Commonwealth of Australia. (2009). *Transforming Australia's higher education system*. ACT: Australian Government Retrieved from <http://www.innovation.gov.au/HigherEducation/ResourcesAndPublications/TransformingAustraliasHigherEducationSystem/Pages/default.aspx>.
- Cram, B., & Watson, L. (2008). *Managing credit transfer from TAFE to university: the case for cross-sectoral collaboration*. Paper presented at the AVETRA 11th Annual Conference, VET in Context, Adelaide. <http://www.avetra.org.au/AVETRA%20WORK%2011.04.08/CS2.1%20-%20Barbara%20Cram%20-%20Croucher%20-%20Lines.pdf>

- Creswell, J. W. (2014). *Educational research: research design: qualitative, quantitative and mixed methods approaches*. (P. A. Smith Ed. 4th ed.). Croydon, UK.: SAGE Publications.
- Cronbach, L. J., & Shavelson, R. J. (2004). My current thoughts on coefficient alpha and successor procedures. *Educational and Psychological Measurement*, 64(3), 391-418. doi: 10.1177/0013164404266386
- Curtis, D. (2008). VET pathways taken by school leavers *Longitudinal Surveys of Australian Youth*. Camberwell, Victoria: Australian Council for Educational Research.
- Darmawan, I. G. N. (2003). *Implementation of information technology in local government in Bali, Indonesia*. Adelaide: Flinders University Institute of International Education.
- Darmawan, I. G. N., & Keeves, J. P. (2009). Using multilevel analysis. In C. R. Aldous, I. G. N. Darmawan, & J. P. Keeves (Eds.), *Change over time in learning numeracy and literacy in rural and remote schools* (Vol. 2, pp. 48-60): Shannon Research Press.
- Davidson, W. B., Beck, H. P., & Milligan, M. (2009). The college persistence questionnaire: development and validation of an instrument that predicts student attrition. *Journal of college student development*, 50(4), 373-390. doi: 10.1353/csd.0.0079
- Dawkins, J. (1988). *Higher Education: a policy statement*. Canberra: Australian Government Publishing Services Retrieved from <http://www.voced.edu.au/content/ngv%3A9695>.
- Deng, X., Lu, Z., & Cao, Z. (2007). Attrition Patterns in a Diversified Student Body: A Case Study. *The Journal of the Education Research Group of Adelaide*, 1(1), 15-25.
- DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (1999). An event history model of student departure. *Economics of education review*, 18, 375-390. doi: 10.1016/s0272-7757(98)00049-1
- Devlin, M., & O'Shea, H. (2011). Directions for Australian higher education institutional policy and practice in supporting students from low socioeconomic backgrounds. *Journal of Higher Education Policy and Management*, 33(5), 529-535. doi: 10.1080/1360080X.2011.605227
- DeWitz, S. J., Woolsey, M. L., & Walsh, W. B. (2009). College student retention: an exploration of the relationship between self-efficacy beliefs and purpose in life among college students. *Journal of college student development*, 50(1), 19-34. doi: 10.1353/csd.0.0049
- Dietsche, P. H. J. (1990). Freshman attrition in a college of applied arts and technology of Ontario. *The Canadian Journal of Higher Education*, 20(3), 65-84.
- DiStefano, C., Zhu, M., & Mindrila, D. (2009) Understanding and using factor scores: consideration for the applied researcher. *Practical assessment research & evaluation*, 14(20). Available online: <http://pareonline.net/getvn.asp?v=14&n=20> .
- Eagleman, D. (2015). *The brain: the story of you*. Edinburgh: Canongate Books.
- Edwards, D., & McMillan, J. (2015). Completing university in Australia *Joining the Dots, Research Briefing* (Vol. 3). Camberwell, Melbourne: Australian Council for Educational Research.
- Eimers, M. T., & Pike, G. R. (1997). Minority and nonminority adjustment to college: differences or similarities? *Research in higher education*, 38(1), 77-97.
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: SAGE Publications Ltd.
- Foley, P. (2007). The socio-economic status of vocational education and training students in Australia. Adelaide: NCVET.
- Fox, R. N. (1986). Application of a conceptual model of college withdrawal to disadvantaged students. *American educational research journal*, 23(3), 415-424. doi: 10.3102/00028312023003415
- Franke, R. (2012). *Towards the education nation: revising the impact of financial aid, college experience, and institutional context on baccalaureate degree attainment using propensity score matching, multilevel modeling approach*. (Doctor of Philosophy), University of California.
- French, B. F., Immekus, J. C., & Oakes, W. C. (2005). An examination of indicators of engineering students' success and persistence. *Journal of Engineering education*, October 2005, 419-425. doi: 10.1002/j.2168-9830.2005.tb00869.x
- Gabb, R., Milne, L., & Cao, Z. (2006). Understanding attrition and improving transition: a review of recent literature. Retrieved Jan 15, 2013, from <http://tls.vu.edu.au/portal/site/research/reports.aspx>
- Gillard, J. (2008). A higher education revolution: creating a productive, prosperous, modern Australia. Retrieved October 22, 2012, from <http://ministers.deewr.gov.au/gillard/higher-education-revolution-creating-productive-prosperous-modern-australia>
- Gillespie, M., & Noble, J. (1992). Factors affecting student persistence: A longitudinal study. In ACT (Ed.), *ACT Research Report series 92-4* (pp. 1-35): ACT.
- Gloria, A. M. (1997). Chicana academic persistence: creating a university-based community. *Education and urban society*, 30(1), 107-121. doi: 10.1177/0013124597030001007
- Gloria, A. M., Robinson Kurpius, S. E., Hamilton, K. D., & Willson, M. S. (1999). African American student's persistence at a predominantly white university: Influences of social support, university comfort and self-beliefs. *Journal of college student development*, 40(3), 257-268.

- Goldstone, R. L., & Janssen, M. A. (2005). Computational models of collective behaviour. *Trends in cognitive sciences*, 9(9), 424-430. doi: 10.1016/j.tics.2005.07.009
- Grebennikov, L., & Shah, M. (2012). Investigating attrition trends in order to improve student retention. *Quality Assurance in Education*, 20(3), 223-236. doi: 10.1108/09684881211240295
- Grimes, S. K., & Antworth, T. (1996). Community college withdrawal decisions: student characteristics and subsequent reenrolment patterns. *Community college journal of research and practice*, 20(4), 345-361. doi: 10.1080/1066892960200405
- Group of Eight Australia. (2012). Policy note: number 3 February 2012. Retrieved September 1, 2012, from [www.go8.edu.au/\\_\\_documents/go8-policy-analysis/2012/go8policynote3\\_universityadmissions.pdf](http://www.go8.edu.au/__documents/go8-policy-analysis/2012/go8policynote3_universityadmissions.pdf)
- Group of Eight Australia. (2014). Backgrounder: The higher education providers in Australia. from [https://go8.edu.au/sites/default/files/docs/publications/backgrounder\\_-\\_private\\_higher\\_education\\_providers\\_in\\_australia\\_final.pdf](https://go8.edu.au/sites/default/files/docs/publications/backgrounder_-_private_higher_education_providers_in_australia_final.pdf)
- Hagedorn, L. S. (2012). How to define retention: a new look at an old problem. In A. Seidman (Ed.), *College student retention: formula for student success* (2nd ed., pp. 81-100). Lanham, Maryland: Rowman & Littlefield.
- Hall, C. (1999). *African American college students at a predominantly white institution: patterns of success*. Paper presented at the 39th annual meeting of the Association for Institutional Research, Seattle, WA. <http://files.eric.ed.gov/fulltext/ED443317.pdf>
- Harris, R., & Rainey, L. (2012). Learning pathways between and within vocational and higher education: towards a typology? *Australian Educational Researcher*, 39, 107-123. doi: 10.1007/s13384-012-0052-1
- Hart, M. (2012, November 21). *Improving qualifications completions in the English VET system*. Paper presented at the NCVET Research Forum: does completing matter? Understanding and measuring completions in VET, Melbourne Convention Centre, Melbourne, Victoria.
- Harvey, A., & Szalkowicz, G. (2015). From departure to arrival: re-engaging students who have withdrawn from university. *Journal of Further and Higher Education*. doi: 10.1080/0309877X.2015.1062852
- Hassard, M. (2011). Griffith University: VET credit transfer and articulation. Retrieved October 18, 2012, from <http://3darticulation.com.au/wp-content/uploads/IACT-paper-GU-VET-best-practice.pdf>
- Hausmann, L. R. M., Schofield, J. W., & Woods, R. L. (2007). Sense of belonging as a predictor of intentions to persist among African American and white first-year college students. *Research in higher education*, 48(7), 803-839. doi: 10.1007/s11162-007-9052-9
- Hausmann, L. R. M., Ye, F., Schofield, J. W., & Woods, R. L. (2009). Sense of belonging and persistence in White and African American first-year students. *Research in higher education*, 50, 649-669. doi: 10.1007/s11162-009-9137-8
- Hays, R. B., & Oxley, D. (1986). Social network development and functioning during a life transition. *Journal of personality and social psychology*, 50(2), 305-313. doi: 10.1037//0022-3514.50.2.305
- HEFCE. (2010). Foundation degrees:key statistics 2001-02 to 2009-10. Retrieved November 1, 2012, from [http://www.hefce.ac.uk/pubs/year/2010/201012/10\\_12.pdf](http://www.hefce.ac.uk/pubs/year/2010/201012/10_12.pdf)
- Hill, G. W. (1982). Group versus individual performance: Are N + 1 heads better than one? *Psychological Bulletin*, 91(3), 517-539. doi: 10.1037/0033-2909.91.3.517
- Hillman, K. (2005). *The first experience: the transition from secondary school to university and TAFE in Australia LSAY Rsearch Reports*. Camberwell, Victoria: Australian Council for Educational Research.
- Hinsz, V. B., Tindale, R. S., & Vollrath, D. A. (1997). The emerging conceptualization of groups as information processors. *Psychological Bulletin*, 121(1), 43-64. doi: 10.1037/0033-2909.121.1.43
- Ho, R. (2014). *Handbook of univariate and multivariate data analysis with IBM SPSS* (2nd ed.). Boca Raton, Florida: CRC Press.
- Hoelscher, M., Hayward, G., Ertl, H., & Dunbar, H. (2008). The transition from vocational education and training to higher education: a successful pathway? *Research papers in education*, 23(2), 139-151. doi: 10.1080/02671520802048679
- Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: sensitivity to underparameterized model misspecification. *Psychological methods*, 3(4), 424-453. doi: 1082-989x.3.4.424
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives, structural equation modeling. *A Multidisciplinary Journal*, 6(1), 1-55. doi: 10.1080/10705519909540118
- IBM Corporation. (2011). *IBM SPSS statistics 20 core system: user's guide*. Retrieved from <https://www.csun.edu/sites/default/files/statistics20-core-system-guide-64bit.pdf>
- Iffert, R. E. (1958). *Retention and withdrawal of college students*. Washington D.C.: U.S. Government Printing Office.
- Jackson, A., Paez, D., Byrnes, J., Dwyer, C., & Blacker, J. (2011). Articulation pathway models: a visual guide to pathways between VET and HE. Retrieved December 15, 2012, from <http://3darticulation.com.au/enabling-resources/articulation-pathway-models/>

- James, R. (2002). Socio-economic background and higher education participation: an analysis of school students' aspirations and expectations. Canberra: Commonwealth Department of Education Science and Training.
- James, R., Anderson, M., Bexley, E., Devlin, M., Garnett, R., Marginson, S., & Maxwell, L. (2008). Participation and equity: A review of the participation in higher education of people from low socioeconomic backgrounds and indigenous people. Canberra: Universities Australia.
- Karmel, T. (2008). *Reflections on the tertiary education sector in Australia*. Paper presented at the Charting New Terrain: Creating and Maintaining a Diversified Tertiary Education Sector in Australia, Langham Hotel, Melbourne.
- Karmel, T. (2012, November 21). *Examining the evidence*. Paper presented at the NCVET Research Forum: does completing matter? Understanding and measuring completions in VET, Melbourne Convention Centre, Melbourne, Victoria.
- Keating, S., Davies, M., & Holden, S. (2006). Issues in transition: why does first year have to be so hard? An exploratory study. Melbourne: Victoria University.
- Keeves, J. P., & Sellin, N. (1997). Multilevel analysis. In J. P. Keeves (Ed.), *Educational research, methodology and measurement: an international handbook* (2nd ed., pp. 394-403). Cambridge, UK: Pergamon.
- Kuh, G. D. (2001). Organizational culture and student persistence: prospects and puzzles. *Journal of college student retention*, 3(1), 23-29. doi: 10.2190/u1rn-c0uu-wxrv-0e3m
- Lamb, S., Jackson, J., Walstab, A., & Huo, S. (2015). Educational opportunity in Australia 2015: who succeeds and who misses out. Melbourne: Centre for International Research on Education Systems, Victoria University.
- Laurente, Z., & Pailthorp, K. (2002). Transfer patterns, information item, California Postsecondary Education Commission. Retrieved 5th August, 2016, from [http://www.cpec.ca.gov/Agendas/Agenda0212/Tab\\_07.pdf](http://www.cpec.ca.gov/Agendas/Agenda0212/Tab_07.pdf)
- Lent, R. W., Brown, S. D., & Gore, P. A. (1997). Discriminant and predictive validity of academic self-concept, academic self-efficacy, and mathematics-specific self-efficacy. *Journal of counseling psychology*, 44(3), 307-315. doi: 10.1037//0022-0167.44.3.307
- Lent, R. W., Brown, S. D., & Larkin, K. C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. *Journal of counseling psychology*, 31(3), 356-362. doi: 10.1037//0022-0167.31.3.356
- Liu, E., & Liu, R. (1999). An application of Tinto's model at a commuter campus. *Education*, 119(3), 537-541.
- Lomax-Smith, J., Watson, L., & Webster, B. (2011). Higher education base funding review: final report (Vol. 2012). Canberra ACT: Department of Education, Employment and Workplace Relations.
- Long, M., Ferrier, F., & Heagney, M. (2006). Stay, play or give it away? Students continuing, changing or leaving university study in first year: Centre for the Economics of Education and Training, Monash University.
- Lovat, A. (2012). *TAFE SA pathways to university: an evaluation*. Report. University of Adelaide. Adelaide.
- Macy, M. W., & Willer, R. (2002). From factors to actors: computational sociology and agent-based modeling. *Annual Review of Sociology*, 28, 143-166. doi: 10.1146/annurev.soc.28.110601.141117
- Marks, G. (2007). Completing university: characteristics and outcomes of completing and non completing students *LSAY Research Reports*. Camberwell, Victoria: Australian Council for Educational Research.
- Martin, S. (2015, August 25). Reform tipped to shape uni funding. *The Australian*, p. 7.
- McInnis, C., & James, R. (2004). Access and retention in Australian higher education. In H. Eggins (Ed.), *Retention and student success in higher education* (pp. 32-45). Cornwall, UK: Open University Press.
- McKenzie, K., & Schweitzer, R. (2001). Who succeeds at university? Factors predicting academic performance in first year Australian university students. *Higher education research & development*, 20(1), 21-33.
- McMillan, J. (2005). Course change and attrition from higher education *LSAY research reports* (Vol. 39): Australian Council for Educational Research.
- McMillan, J. (2008). University study in Australia: persistence, completion and beyond *LSAY Briefing Reports*: Australian Council for Educational Research.
- McMillan, J. (2011). Student retention: current evidence and insights for improvement *Joining the Dots, Research briefing* (Vol. 1). Camberwell, Victoria: Australian Council for Educational Research.
- McNeely, J. (1937). *College student mortality*. Washington D. C.: U.S. Government Printing Office.
- Milne, L., & Gabb, R. (2007). Transition into higher education at Victoria University: a student view: Postcompulsory Education Centre, Victoria University: Melbourne.
- Milne, L., Glaisher, S., & Keating, S. (2006). Making articulation work: TAFE to higher education at Victoria University, final report. Retrieved January 15, 2013, from <http://tls.vu.edu.au/portal/site/research/reports.aspx>
- Moody, G. (2003). *VET-higher ed transfers and the structure of tertiary education*. Paper presented at the The changing face of VET, Australian Technology Park, Garden Street, Eveleigh NSW, Sydney, Australia. Non refereed paper retrieved from [http://www.avetra.org.au/abstracts\\_and\\_papers\\_2003/Moodie.pdf](http://www.avetra.org.au/abstracts_and_papers_2003/Moodie.pdf)
- Moody, G. (2009). 'Australia'. The emergence of dual sector universities. In B. McFarlane (Ed.), *Challenging boundaries, managing the integration of post-secondary education* (pp. 59-76). New York: Routledge.
- Moody, G. (2012). Mixed-sector tertiary education. Adelaide: NCVET.

- Morrison, L., & Silverman, L. (2012). Retention theories, models, and concepts. In A. Seidman (Ed.), *College student retention: formula for student success* (2nd ed., pp. 61-80). Lanham, Maryland: Rowman & Littlefield.
- Muldoon, R. (2009). Recognizing the enhancement of graduate attributes and employability through part-time work while at university. *Active Learning in Higher Education*, 10(3), 237-252. doi: 10.1177/1469787409343189
- Munro, B. H. (1981). Dropouts from higher education: path analysis of a national sample. *American educational research journal*, 18(2), 133-141. doi: 10.3102/00028312018002133
- Muthen, L. K., & Muthen, B. O. (1998-2012). *Mplus user's guide* (7th ed.). Los Angeles, CA.
- Napoli, A. R., & Wortman, P. M. (1998). Psychological factors related to retention and early departure of two-year community college students. *Research in higher education*, 39(4), 419-455.
- NCVER. (2012). Australian vocational education and training statistics: tertiary education and training in Australia 2010. Adelaide: NCVER.
- NCVER. (2014). Australian vocational education and training statistics: students and courses 2013. Adelaide: NCVER.
- Niehaus, E., Capbell, C. M., & Inkelas, K. K. (2014). HLM behind the curtain: unveiling decisions behind the use and interpretation of HLM in higher education research. *Research in higher education*, 55, 101-122. doi: 10.1007/s11162-013-9306-7
- Nora, A. (1987). Determinants of retention among Chicano college students: a structural model. *Research in higher education*, 26(1), 31-59. doi: 10.1007/bf00991932
- Nora, A., & Cabrera, A. F. (1993). The construct validity of institutional commitment: a confirmatory factor analysis. *Research in higher education*, 34(2), 243-262. doi: 10.1007/bf00992164
- Nora, A., Cabrera, A. F., Hagerdorn, L. S., & Pascarella, E. T. (1996). Differential impacts of academic and social experiences on college-related behavioral outcomes across different ethnic and gender groups at four-year institutions. *Research in higher education*, 37(4), 427-451. doi: 10.1007/bf01730109
- Nora, A., & Crisp, G. (2012). Student persistence and degree attainment beyond the first year in college: existing knowledge and directions for future research. In A. Seidman (Ed.), *College student retention: formula for student success* (pp. 229-250). Lanham, Maryland: Rowman & Littlefield.
- Nordin, A. R., Keeves, J. P., & Darmawan, I. G. N. (2013). Developing a modelling approach and the examination of models. In I. G. N. Darmawan & C. R. Aldous (Eds.), *Numeracy in South Australian primary schools* (Vol. 3, pp. 27-63). Renmark, South Australia: Shannon Research Press.
- Oseguera, L. (2005). Four and six-year baccalaureate degree completion by institutional characteristics and racial/ethnic groups. *Journal of college student retention*, 7(1-2), 19-59. doi: 10.2190/e1tu-aw8j-5fya-glpw
- Oseguera, L., & Rhee, B. S. (2009). The influence of institutional retention climates on student persistence to degree completion: a multilevel approach. *Research in higher education*, 50, 546-569. doi: 10.1007/s11162-009-9134-y
- Pace, C. R. (1982). Achievement and the quality of student effort. Washington, DC: National Commission on Excellence in Education.
- Pantages, T. J., & Creedon, C. F. (1978). Studies of attrition: 1950-1975. *Review of educational research*, 48(1), 49-101. doi: 10.3102/00346543048001049
- Pascarella, E. T. (1985). Racial differences in factors associated with Bachelor's degree completion: a nine-year follow-up. *Research in higher education*, 23(4), 351-373. doi: 10.1007/bf00973685
- Pascarella, E. T., & Chapman, D. W. (1983a). A multiinstitutional, path analytic validation of Tinto's model of college withdrawal. *American educational research journal*, 20(1), 87-102. doi: 10.3102/00028312020001087
- Pascarella, E. T., & Chapman, D. W. (1983b). Validation of a theoretical model of college withdrawal: interaction effects in a multi-institutional sample. *Research in higher education*, 19(1), 25-48. doi: 10.1007/bf00977337
- Pascarella, E. T., & Terenzini, P. T. (1979). Interaction effects in Spady and Tinto's conceptual models of college attrition. *Sociology of education*, 52(4), 197-210. doi: 10.2307/2112401
- Pascarella, E. T., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *The Journal of Higher Education*, 51(1), 60-75. doi: 10.2307/1981125
- Pascarella, E. T., & Terenzini, P. T. (1983). Predicting voluntary freshman year persistence/withdrawal behavior in a residential university: a path analytic validation of Tinto's model. *Journal of educational psychology*, 75(2), 215-226. doi: 10.1037/0022-0663.75.2.215
- Pattison, S. (2012, November 21). *How are completion rates measured?* Paper presented at the NCVER Research Forum: does completing matter? Understanding and measuring completions in VET, Melbourne Convention Centre, Melbourne, Victoria.
- Peterson, R. A. (1994). A meta-analysis of cronbach's coefficient alpha. *Journal of consumer research*, 21, 381-391. Doi: 0093-5301/95/2102-0011252.00
- Ramsay, E., Tranter, D., Charlton, S., & Sumner, R. (1998). Higher Education access and equity for low SES school leavers: a case study: University of South Australia.

- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: applications and data analysis methods* (Vol. 1). Thousand Oaks, California: Sage Publications.
- Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., & Congdon, R. (2004). *HLM 6: Hierarchical linear and nonlinear modeling*. Lincolnwood, Illinois: Scientific Software International.
- Resnick, L. B. (2010). Nested learning systems for the thinking curriculum. *Educational researcher*, 39(3), 183-197. doi: 10.3102/0013189X10364671
- Robbins, S. B., Lauver, K., Le, H., Davis, D., & Langley, R. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, 130(2), 261-288. doi: 10.1037/0033-2909.130.2.261
- Saeed, A. A. (2008). *A study of the factors affecting student retention at King Saud university, Saudi arabia: structural equation modelling and qualitative methods*. (Doctor of Philosophy), Stirling University. Retrieved from <https://dspace.stir.ac.uk/handle/1893/691>
- Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological assessment*, 8(4), 350-353. doi: 1040-3590/96/53.00
- Schuetz, P. (2008). A theory-driven model of community college student engagement. *Community college journal of research and practice*, 32(4-6), 305-324. doi: 10.1080/10668920701884349
- Seidman, A. (2005). Minority student retention: resources for practitioners. *New directions for institutional research*, 125(Spring), 7-24. doi: 10.1002/ir.136
- Seidman, A. (2012). *College student retention: formula for student success* (2nd ed.). Lanham, Maryland: Rowman & Littlefield.
- Shaw, M. E. (1932). A comparison of individuals and small groups in the rational solution of complex problems. *The American Journal of Psychology*, 44(3), 491-504. doi: 10.2307/1415351
- Sherman, M. S., Giles, M. B., & Williams-Green, J. (1994). Assessment and retention of black students in higher education. *The journal of negro education*, 63(2), 164-180. doi: 10.2307/2967381
- Simeoni, R. J. (2009). *Student retention trends within a health foundation year and implications for orientation, engagement and retention strategies*. Paper presented at the 12th Pacific Rim first year in higher education conference 2009, Townsville. Refereed paper retrieved from [http://fyhe.com.au/past\\_papers/papers09/index.html](http://fyhe.com.au/past_papers/papers09/index.html)
- Snijders, T., & Bosker, R. (1999). *Multilevel analysis: an introduction to basic and advanced multilevel modeling*. London: SAGE Publications.
- Spady, W. G. (1970). Dropouts from higher education: an interdisciplinary review and synthesis. *Interchange*, 1, 109-121. doi: 10.1007/bf02214313
- Spady, W. G. (1971). Dropouts from higher education: toward an empirical model. *Interchange*, 2, 38-62. doi: 10.1007/bf02282469
- Stewart, J. F., Mallery, C., & Choi, J. (2013). College student persistence: a multilevel analysis of distance learning course completion at the crossroads of disability status. *Journal of college student retention*, 15(3), 367-385. doi: 10.2190/CS.15.3.d
- Sullivan, R. (2015). Australia's top 10 baby names. Retrieved from news.com.au. Lifestyle website: <http://www.news.com.au/lifestyle/parenting/babies/australias-top-10-baby-names/news-story/740a8b651053fc93a90200de9e619767>
- Summerskill. (1962). Dropouts from college. In N. Sanford (Ed.), *The American college: a psychological and social interpretation of the higher learning*. New York: Wiley.
- Sumpter, D. J. T. (2006). The principles of collective animal behaviour. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 361, 5-22. doi: 10.1098/rstb.2005.1733
- Swenson Goguen, L. M., Hiester, M. A., & Nordstom, A. H. (2010). Associations among peer relationships, academic achievement, and persistence in college. *Journal of college student retention*, 12(3), 319-337. doi: 10.2190/CS.12.3.d
- Tabachnick, B. G. & Fidell, L. S. (2007). *Using multivariate statistics* (5<sup>th</sup> Ed.). Boston, Massachusetts, Pearson Education.
- Taylor, D. W., & Faust, W. L. (1952). Twenty questions: efficiency in problem solving as a function of size of group. *Journal of experimental psychology*, 44(5), 360-368. doi: 10.1037/h0054376
- Tharp, J. (1998). Predicting persistence of urban commuter campus students utilizing student background characteristics from enrollment data. *Community college journal of research and practice*, 22(3), 279-294. doi: 10.1080/1066892980220307
- Thomas, S. L. (2000). Ties that bind: a social network approach to understanding student integration and persistence. *The Journal of Higher Education*, 71(5), 591-615. doi: 10.2307/2649261
- Tinto, V. (1975). Dropout from higher education: a theoretical synthesis of recent research. *Review of educational research*, 45, 89-125. doi: 10.3102/00346543045001089

- Tinto, V. (1982). Limits of theory and practice in student attrition. *The Journal of Higher Education*, 53(6), 687-700. doi: 10.2307/1981525
- Tinto, V. (1987). *Leaving college: rethinking the causes and cures of student attrition*. Chicago, Illinois: University of Chicago Press.
- Tinto, V. (1993). *Leaving college: rethinking the causes and cures of student attrition* (2nd ed.). Chicago, Illinois: University of Chicago Press.
- Tinto, V. (2006). Research and practice of student retention what next. *Journal of college student retention*, 8(1), 1-19. doi: 10.2190/c0c4-ef9-eg7w-pwp4
- Tinto, V. (2012). Moving from theory to action: a model of institutional action for student success. In A. Seidman (Ed.), *College student retention: formula for student success* (2nd ed., pp. 251-266). Lanham, Maryland: Rowman & Littlefield.
- Titus, M. A. (2004). An examination of the influence of institutional context on student persistence at 4-year colleges and universities: a multilevel approach. *Research in higher education*, 45(7), 673-699. doi: 10.1023/b:rihe.0000044227.17161.fa
- Titus, M. A. (2006a). Understanding college degree completion of students with low socioeconomic status: the influence of the institutional financial context. *Research in higher education*, 47(4), 371-398. doi: 10.1007/s11162-005-9000-5
- Titus, M. A. (2006b). Understanding the influence of the financial context of institutions on student persistence at four-year colleges and universities. *Journal of higher education*, 77(2), 353-375. doi: 10.1353/jhe.2006.0009
- Torres, V. (2006). A mixed method study testing data-model fit of a retention model for Latino/a students at urban universities. *Journal of college student development*, 47(3), 299-318. doi: 10.1353/csd.2006.0037
- Tuijnman, A. C., & Keeves, J. P. (1997). Path analysis and linear structural relations analysis. In J. P. Keeves (Ed.), *Educational research, methodology and measurement: an international handbook* (2nd ed., pp. 621-632). Cambridge, UK: Pergamon.
- Universities Australia. (2013). University profiles. Retrieved April 26, 2013, from <http://www.universitiesaustralia.edu.au/resources/6/1019>
- University of South Australia. (2010). 2011 pathways to UniSA from TAFE and Registered Training Organisations. Retrieved November 27, 2012, from [http://w3.unisa.edu.au/future/advisers/pdf/tafe\\_pathways\\_2011\\_web.pdf](http://w3.unisa.edu.au/future/advisers/pdf/tafe_pathways_2011_web.pdf)
- Wang, J., & Wang, X. (2012). *Structural equation modeling: applications using Mplus*. West Sussex UK: Higher Education Press.
- Watson, L. (2006). *Barriers to successful transitions from VET to HE - a case study of student pathways in early childhood education and care*. Paper presented at the Ninth Annual Conference of the Australian Vocational Education and Training Research Association (AVETRA), University of Wollongong.
- Watson, L., Hagel, P., & Chesters, J. (2013). A half-open door: pathways for VET award holders into Australian universities. Adelaide: NCVER.
- Wheelahan, L. (2005). Student progress and retention by basis of admission for 2002, 2003 & 2004 commencing students: Brisbane, Australia: Griffith University.
- Wheelahan, L. (2009). *What kind of access does VET provide to higher education for low SES students? Not a lot*. Paper presented at the Student Equity in Higher Education: What we know. What we need to know., National Centre for Student Equity in Higher Education, University of South Australia.
- Wheelahan, L., Arkoudis, S., Moody, G., Fredman, N., & Bexley, E. (2012). Shaken not stirred? The development of one tertiary education sector in Australia *NCVER Monograph Series* (Vol. 8). Adelaide: NCVER.
- Wheelahan, L., & Moody, G. (2011). Renegotiating sectoral relations: educational issues. Retrieved August 12, 2016, from [http://s3.amazonaws.com/academia.edu.documents/35122969/Wheelahan\\_institutional\\_principles\\_\\_\\_strategies\\_to\\_support\\_credit\\_pathways.pdf?AWSAccessKeyId=AKIAJ56TQJRTWSMTNPEA&Expires=1475740551&Signature=ANG18RIAIWNzC%2BerzFkhifUNluM%3D&response-content-disposition=inline%3B%20filename%3DWheelahan\\_Leesa\\_and\\_Moodie\\_Gavin\\_2011\\_Re.pdf](http://s3.amazonaws.com/academia.edu.documents/35122969/Wheelahan_institutional_principles___strategies_to_support_credit_pathways.pdf?AWSAccessKeyId=AKIAJ56TQJRTWSMTNPEA&Expires=1475740551&Signature=ANG18RIAIWNzC%2BerzFkhifUNluM%3D&response-content-disposition=inline%3B%20filename%3DWheelahan_Leesa_and_Moodie_Gavin_2011_Re.pdf)
- Williams Wooley, A., Chabris, C., Pentland, A., Hashmi, N., & Malone, T. (2010). Evidence for a collective intelligence factor in the performance of human groups. *Science*, 330, 686-688. doi: 10.1126/science.1193147
- Yorke, M., & Longden, B. (2004). *Retention and student success in higher education*. Cornwall, UK: Open University Press.
- Zumbrum, S. M., C. Buhs, E. Hawley, L. R. (2014). Support, belonging, motivation, and engagement in the college classroom: a mixed method study. *Instructional Science*, 42, 661-684. doi: 10.1007/s11251-014-9310-0

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\*Note that parts of Appendices 1 to 5 are redacted to keep the identity of the university involved in this investigation anonymous.



## Appendix 1 Survey

**Entry to the [redacted] using a VET pathway**

**General Background**

The survey will focus on your experiences during your first (calendar) year of enrolment at [redacted]. You may have been a full time or part time student. The questions relate to your first year of studies only.

There are seven short sections in the survey. Please note that all questions with an asterisk (\*) need to be answered.

This first section asks questions about your general background particularly as it applied during your first year at the university

**\*1. Which would you consider to be your native language?**

English     Spanish     Chinese     Russian     Vietnamese

Other (please specify)  
[redacted]

**\*2. Were you married when you first enrolled at [redacted]?**

Yes     No

Other (please specify)  
[redacted]

**\*3. Number of dependents when first enrolled at [redacted]**

None     1     2     3     4

If more than 4 please specify how many  
[redacted]

**\*4. Were you working while you were studying in your first year at [redacted] [redacted]?**

Yes     No (skip next question)

Other (please specify)  
[redacted]

**5. If yes, how many hours per week?**  
[redacted]

**\*6. Were you receiving other financial support during your first year of studies at this university (e.g. Austudy)?**

Yes     No

Other (please specify)  
[redacted]

## Entry to the University of Adelaide using a VET pathway

**\*7. Had you completed high school or secondary school when you first enrolled at**  **?**

Yes  No

Other (please specify)

**\*8. Had you completed a TAFE (or other VET) qualification?**

Yes  No (Skip the next question)

Other (please specify)

**\*9. How long had you been away from formal studies when you first enrolled at**  **?**

- Less than 1 year
- Between 1 and 2 years
- Between 2 and 3 years
- Between 3 and 4 years

If more than 4 years, please specify number of years

**\*10. Please identify yourself at this point in time amongst the following (note you may have left the university).**

- Graduated (may or may not be studying now)
- Still studying and expecting to graduate
- Still studying but graduating is not important
- Taking a break but will return to complete degree
- Other (please specify)
- Discontinued before starting and didn't attend any university course events (lectures, tutorials etc.) and stopped studying
- Discontinued after attending one or more university course events and stopped studying
- Discontinued at the University of Adelaide and transferred to another university to complete my degree

**11. If you have discontinued your studies before graduating what was your main reason for doing so?**

**Institutional Commitment**

This section of the survey is asking about your commitment to the University of Adelaide during your first year at the university. Place your answer along the scale which ranges from 'Strongly Disagree' to 'Strongly Agree' in accordance with the statement given in each question. Remember we are asking how you felt DURING YOUR FIRST YEAR OF STUDIES at [redacted]

**\*12. I was confident that I had made the right decision in choosing to attend this university.**

Strongly Disagree     Strongly Agree

**\*13. It was important for me to graduate from this institution as opposed to some other university.**

Strongly Disagree     Strongly Agree

**\*14. I was certain this institution was the right place for me.**

Strongly Disagree     Strongly Agree

**\*15. It was not important for me to graduate from this university.**

Strongly Disagree     Strongly Agree

**\*16. I expected to graduate from this university.**

Strongly Disagree     Strongly Agree

**\*17. I felt like I belonged at this institution.**

Strongly Disagree     Strongly Agree

**\*18. I felt like I was a member at this university.**

Strongly Disagree     Strongly Agree

**\*19. I saw myself as part of this university.**

Strongly Disagree     Strongly Agree

**\*20. I felt emotionally attached to this university.**

Strongly Disagree     Strongly Agree

**\*21. How did you like [redacted] in your first year?**

I didn't like it at all     I liked very much

## Entry to using a VET pathway

### Perceived Educational Ability

This section of the survey asks how confident you were during your first year of your studies at this university.

**\*22. In your first year of studies how confident were you that you could get the grades you wanted?**

Not confident at all

Very confident

**\*23. How good did you think you were at correctly anticipating what was on tests beforehand?**

Not good at all

Very good

**\*24. How effective did you think your study skills were?**

Not effective at all

Very effective

**\*25. When you were waiting for a submitted assignment to be graded, how assured did you feel that the work you had done was acceptable?**

Not assured at all

Very assured

**\*26. How much doubt did you have about being able to make the grades you wanted?**

A lot of doubt

No doubt at all

**\*27. In your first year of studies how confident were you that you could complete the requirements for your subject(s) with at least a Pass grade?**

Not confident at all

Very confident

### Perceived Performance

In this section of the survey you are asked your view of your performance during your first year of study at

**\*28. What were most of your grades in your first year at this university?**

Below Pass

Pass

Credit

Distinction

High Distinction

**\*29. If a student who received all Pass grades in their first year at this university has a Grade Point Average (GPA) of 4, what would your first year GPA have been at this university?**

Well below 4

Below 4

Around 4

Above 4

Well above 4

## Entry to using a VET pathway

**\*30. What did you think of your grades during your first year at this university?**

Very low

Very high



**\*31. How would you rate your academic performance in the first year at this university?**

Not good at all

Excellent



**\*32. I achieved acceptable results in my first year at this university.**

Strongly Disagree

Strongly Agree



**\*33. My results were good enough in my first year at this university.**

Strongly Disagree

Strongly Agree



### Perceived Effort

This section will ask about the effort that you put in during the first year of studies at this university.

**\*34. How many contact hours (in lectures, tutorials etc.) a week did you spend at this university during your first semester of enrolment?**

A lot fewer hours than I expected

As many hours as I expected

A lot more hours than I expected



**\*35. How many hours a week did you usually spend outside of class (i.e. non-contact hours) in your first year of studies on activities related to your academic program such as studying, writing, reading, rehearsing etc.?**

A lot fewer hours than I expected

As many hours as I expected

A lot more hours than I expected



**\*36. The time (contact and non-contact hours) you spent on your studies in your first year at this university was:**

Very little

About right

Very much



**\*37. How much effort did you put into your studies in the first year at this university?**

Very little

About right

Very much



**\*38. It was difficult to find enough time for my studies in the first year of at this university.**

Strongly Agree

Strongly Disagree



## Entry to [redacted] using a VET pathway

### Social Networks

This section asks questions about the number friends and acquaintances you had in your first year.

**\*39. How many student acquaintances did you have in your first year at this university?**

None  1  2  3  4  5  6  7  8  9  10

If more than 10 please specify

**\*40. How many of these did you consider as a close personal friend?**

None  1  2  3  4  5  6  7  8  9  10

If more than 10 please specify

**\*41. How many of these did you consider as a source of academic advice?**

None  1  2  3  4  5  6  7  8  9  10

If more than 10 please specify

**\*42. How many of these did you consider as a source of social advice?**

None  1  2  3  4  5  6  7  8  9  10

If more than 10 please specify

### Social Integration (during your first year of study at the university)

This section of the survey asks about your relationships with your fellow students and with university staff.

**\*43. The student friendships I had in my first year at this university were personally satisfying.**

Strongly Disagree      Strongly Agree

**\*44. I developed close personal relationships with other students in my first year at this university.**

Strongly Disagree      Strongly Agree

**\*45. My personal relationships with other students had a positive influence on my attitudes and values in my first year at this university.**

Strongly Disagree      Strongly Agree

Entry to  using a VET pathway

**\*46. My personal relationships with other students had a positive influence on my interest in ideas in my first year at this university.**

Strongly Disagree



Strongly Agree

**\*47. It was difficult for me to meet and make friends with other students in my first year.**

Strongly Disagree



Strongly Agree

**\*48. My non classroom interactions with academic lecturing staff had a positive influence on my attitudes and values in my first year at this university.**

Strongly Disagree



Strongly Agree

**\*49. My non classroom interactions with academic lecturing staff had a positive influence on my interest in ideas in my first year at this university.**

Strongly Disagree



Strongly Agree

**\*50. My non classroom interactions with academic lecturing staff had a positive influence on my career goals and aspirations in my first year at this university.**

Strongly Disagree



Strongly Agree

**\*51. I was satisfied with the opportunities to meet and interact with academic lecturing staff members in my first year at this university.**

Strongly Disagree



Strongly Agree

**\*52. I developed personal relationships with at least one university administrative staff member in my first year at this university.**

Strongly Disagree



Strongly Agree

**One final question**

**\*53. To help the university understand students like yourself and in conjunction with a current PhD project would you be interested in participating in a short interview outlining your experiences?**

Yes

No

## Appendix 2 Ethics Approval letter



RESEARCH BRANCH  
OFFICE OF RESEARCH ETHICS, COMPLIANCE AND  
INTEGRITY

BEVERLEY DOBBS  
EXECUTIVE OFFICER  
LOW RISK HUMAN RESEARCH ETHICS REVIEW  
GROUP (FACULTY OF HUMANITIES AND SOCIAL  
SCIENCES AND FACULTY OF THE PROFESSIONS)  
THE UNIVERSITY OF ADELAIDE  
SA 5005  
AUSTRALIA

TELEPHONE +61 8 8313 4725  
FACSIMILE +61 8 8313 7325  
email: beverley.dobbs@adelaide.edu.au

22 October 2013

Dr I Darmawan  
School: Education

Dear Dr Darmawan

ETHICS APPROVAL No: HP-2013-110  
PROJECT TITLE: Factors contributing toward attrition of students entering a   
university through new VET entry pathways

I write to advise that the Low Risk Human Research Ethics Review Group (Faculty of Humanities and Social Sciences and the Faculty of the Professions) has approved the above project. The ethics expiry date for this project is **31 Oct 2016**.

Ethics approval is granted for three years subject to satisfactory annual progress and completion reporting. The form titled *Project Status Report* is to be used when reporting annual progress and project completion and can be downloaded at <http://www.adelaide.edu.au/ethics/human/guidelines/reporting>. On expiry, ethics approval may be extended for a further period.

Participants in the study are to be given a copy of the Information Sheet and the signed Consent Form to retain. It is also a condition of approval that you **immediately report** anything which might warrant review of ethical approval including:

- serious or unexpected adverse effects on participants,
- previously unforeseen events which might affect continued ethical acceptability of the project,
- proposed changes to the protocol; and
- the project is discontinued before the expected date of completion.

Please refer to the following ethics approval document for any additional conditions that may apply to this project.

Yours sincerely

ASSOCIATE PROFESSOR RACHEL A. ANKENY  
Convenor  
Low Risk Human Research Ethics Review Group (Faculty of  
Humanities and Social Sciences and Faculty of the Professions)





RESEARCH BRANCH  
OFFICE OF RESEARCH ETHICS, COMPLIANCE AND  
INTEGRITY

BEVERLEY DOBBS  
EXECUTIVE OFFICER  
LOW RISK HUMAN RESEARCH ETHICS REVIEW  
GROUP (FACULTY OF HUMANITIES AND SOCIAL  
SCIENCES AND FACULTY OF THE PROFESSIONS)  
THE UNIVERSITY OF ADELAIDE  
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TELEPHONE +61 8 8313 4725  
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email: beverley.dobbs@adelaide.edu.au

**Applicant:** Dr I Darmawan  
**School:** Education  
**Project Title:** Factors contributing toward attrition of  
students entering a [ ] university  
through new VET entry pathways

---

Low Risk Human Research Ethics Review Group (Faculty of Humanities and Social Sciences and the  
Faculty of the Professions)

**ETHICS APPROVAL No:** HP-2013-110 **RM No:** 0000017361

**APPROVED for the period:** 22 Oct 2013 to 31 Oct 2016

Thank you for the response dated 21.10.13. It is noted that this study will be conducted by Alessandro Lovat, PhD  
Candidate

ASSOCIATE PROFESSOR RACHEL A. ANKENY  
Convenor  
Low Risk Human Research Ethics Review Group (Faculty of  
Humanities and Social Sciences and Faculty of the Professions)

## Appendix 3 Survey Information sheets accompanying survey instrument

**Subject:** [ ] VET entrant survey

Dear (Name of Student) ,

The Office [ ] at [ ] in conjunction with a PhD study at the University's School of Education has been conducting research on students entering [ ] from diverse pathways. The study 'Factors contributing toward attrition for students entering university through new VET entry pathways' is now taking place and is hoping to identify some factors that influence these students' decisions on whether to continue or discontinue their studies.

As a student that has entered the university with a VET qualification, you are invited to take part in the survey attached to this study. The paper survey is included with this letter. An online survey form has also been sent to your email address via the survey monkey facility. Participation in the study and in this survey is entirely voluntary and will in no way affect your academic progress at the university. Your views and opinions about [ ] and your experiences [ ] would be valued and included in the study. The results are expected to improve the way [ ] later for you and our other students particularly in the transition period of adjustment in the first year of a student's university life. The survey is only expected to take 15 minutes of your time.

If you decide to participate please complete the survey once only via your preferred mode. Place the completed survey in the return paid envelope and simply drop it in any post box. No stamp is needed. All collected information will be strictly used for the purposes of this study and will not identify any student. Your consent to participating in the study will be taken if you decide to complete and return the survey. For more information please find below an Information Sheet and an Independent Complaint Protocol.

A prize draw will be conducted in conjunction with this survey on Monday March 24th 2014. All completed surveys received by Friday March 21st 2014 will be entered in the draw. First prize is a \$100 ColesMyer gift voucher, which will be sent to one lucky winner. There are also 5 minor prizes of a \$20 ColesMyer gift card. The winners will first be contacted both via email and by normal post. Prizes will then be sent by post.

Attached to this letter is an information sheet about the project and an independent complaints form. If you need any further information regarding the survey you may contact the project co-ordinator, Alessandro Lovat, at the School of Education on weekdays on 8313 0490 or via email, alex.lovat@adelaide.edu.au .

Thank-you for your consideration and for those deciding to participate, thanks again and good luck in the Prize Draw.

Alessandro Lovat,  
PhD Candidate  
School of Education,  
The University of Adelaide, South Australia, 5005  
T + 61 8 8313 0490 | E alex.lovat@adelaide.edu.au |



Dr. Igusti Darmawan,  
Senior Lecturer  
School of Education  
The University of Adelaide, South Australia 5005  
T +61 8 8313 5788 | E igusti.darmawan@adelaide.edu.au |

CRICOS Provider Number 00123M

IMPORTANT: This message may contain confidential or legally privileged information. If you think it was sent to you by mistake, please delete all copies and advise the sender.

Information Sheet (Survey Component)

**Factors contributing toward attrition for students entering a [ ] university through new VET entry pathways**

Purpose of the study

The purpose of this study is to evaluate factors that in past studies have been shown to influence university students' decisions to withdraw from their undergraduate studies. Various factors: social integration, institutional commitment, a student's level of confidence and their academic efficiency in terms of effort and perceived performance will be evaluated. This study will assess the amount of influence that these theoretical factors have on students entering a [ ] university through new VET entry pathways. This project has full approval from the University of Adelaide's Human Research Ethics Committee, (HP-2013-110).

Student (past and present) participants taking part in the survey component of the study will be invited to:

- Consent to participate in the study by submitting a completed online survey. Note completion of the survey will be taken as consent to participate.
- Answer the online survey questions, administered via the survey monkey website, on your experiences during your first year of your studies at the university which is expected to take 15 minutes
- Submit the completed survey via the survey monkey website
- Surveys will also be posted out to student participants with a return paid envelope as an alternative method of returning the completed survey.

Possible benefits of the Study

Student participants may receive some benefit in the form of deeper reflection about their experiences and their decisions on whether to continue or discontinue or possibly transfer from their university studies at [ ]. However the major benefit of this study is to gain an understanding of how a number of possible factors influence students' decisions to continue their university studies, with particular reference to students entering via new VET pathways. This understanding will facilitate an increased understanding of the diversity of students' reasons for continuing or discontinuing their studies after entering via new VET entry pathways. The study will enable policies to be put in place that ensure the best possible outcomes for students from a diversity of backgrounds. These benefits however are in no way assured.

Withdrawing from the Study

Student participation is entirely voluntary and any participant can withdraw at any time, including after completing the survey, without prejudice. Participation or non-participation (including withdrawal from the study) will not in any way affect the student relationship with the university in question. Students can withdraw at any time by simply not completing the online survey. If they wish to withdraw after completing the aforementioned survey they need only contact the project supervisor, contact details below, and state their wishes to withdraw. The project supervisor will then remove and destroy the collected information from that participant.

Foreseeable Risks and Adverse Effects of Student Survey Participation

Student participants could feel discomfort answering questions relating to their academic and social experiences whilst studying for their undergraduate programs at the university in question. Any discomfort will be minimized as the questions are broad and worded in general terms. If student participants wish to withdraw from the study at any time without prejudice, even in the middle of, or after answering the survey questions, they are able to do so. They will be made aware of counseling options and lodge a complaint with the Human Research Ethics Committee if they think it is necessary. Students may also avail themselves of the counseling services at [ ] details of which can be accessed by the following link: [ ]

Collection, Use and Publication of Survey Information Arising from this Study

Survey data will be collected and aggregated across all student participants. Results will be reported in terms of 'factors influencing students' decisions to drop out of their university undergraduate studies' and not in terms of any singular student. Results and findings from this study will form part of a PhD dissertation for Alessandro Lovat. There are also plans to publish journal articles arising from the results of this study. If student participants wish to access study results and findings or resulting publications they can contact Mr. Alessandro Lovat through the Office [ ] or via the School of Education at the University of Adelaide (contact details below). Findings are expected to be shared with the university in question, without revealing any identification of specific participants. Results are expected to inform policy in terms of improving access and participation to the university via alternative pathways. Details of university policy regarding this can be found by following the link:

[ ]

Storage and Access to Information Arising from this Study

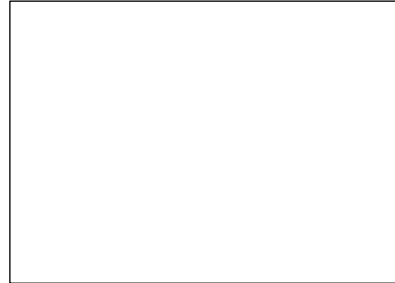
All data will be stored on a secure University server, and will be accessible only to the researcher, Mr. Alessandro Lovat, involved in this study (contact details below)

Confidentiality and Anonymity of Survey Responses

Anonymity and confidentiality of responses will be maintained throughout the research process. All responses will be treated with total confidentiality and aggregated across all students. In any reporting or discussion of findings only aggregated data will be reported and participant identity will remain anonymous.

Contacts:

Mr. Alessandro Lovat  
PhD Candidate  
Coordinator  
School of Education, University of Adelaide  
University of Adelaide  
Level 6, Nexus 10 Pulteney Street.  
Email: alex.lovat@adelaide.edu.au  
Phone: 8313-0490  
Mobile: 0410010508



Dr. Igusti Darmawan  
Senior Lecturer  
School of Education, University of Adelaide  
Level 8, 10 Pulteney Street.  
Email: igusti.darmawan@adelaide.edu.au  
Phone: +61 8 8313 5788

## Contacts for the Project and Independent Complaints Procedure Sheet

The University of Adelaide  
Human Research Ethics Committee (HREC)  
This document is for people who are participants in a research project.

### CONTACTS FOR INFORMATION ON PROJECT AND INDEPENDENT COMPLAINTS PROCEDURE

The following study has been reviewed and approved by the University of Adelaide Human Research Ethics Committee:

Project Title: Factors contributing toward attrition for students entering a  university through new VET entry pathways

Approval Number: HP-2013-110

The Human Research Ethics Committee monitors all the research projects which it has approved. The committee considers it important that people participating in approved projects have an independent and confidential reporting mechanism which they can use if they have any worries or complaints about that research.

This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (see <http://www.nhmrc.gov.au/publications/synopses/e72syn.htm>)

1. If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the project co-ordinator:

Name: Mr. Alessandro Lovat, PhD candidate, School of Education, University of Adelaide  
Phone: (08) 8313 0490 (weekdays)

2. If you wish to discuss with an independent person matters related to:

- making a complaint, or
- raising concerns on the conduct of the project, or
- the University policy on research involving human participants, or
- your rights as a participant,

contact the Human Research Ethics Committee's Secretariat on phone (08) 8313 6028 or by email to [hrec@adelaide.edu.au](mailto:hrec@adelaide.edu.au)

## Appendix 4 Email/letter inviting prospective interviewees

### Preferred contact details:

email: \_\_\_\_\_ (Please write email address if different to the one used)

Phone: \_\_\_\_\_ (Please write your preferred phone number)

Other: \_\_\_\_\_ (If you prefer another method of contact please specify)

Dear (Prospective Interviewee's name),

Thank-you for your participation in our recent survey and for your interest in participating in an interview. I would therefore like to invite you to take part in an interview where you will have the chance to give us more details about your experiences at [\_\_\_\_\_]. The interviews would take place at the University of Adelaide's School of Education on the 6th floor of the Nexus building, 10 Pulteney Street, Adelaide. Your participation is entirely voluntary and your identity and comments would be completely anonymous.

The study is focusing on students entering [\_\_\_\_\_] with a completed VET qualification and is hoping to identify some factors that influence a student's decision to continue or discontinue their studies during their first year at this university. Interview responses will be used as data for a PhD study on the topic.

This project has full approval from the University of Adelaide's Human Research Ethics Committee, (HP-2013-110). Your decision to participate or not will have no bearing whatsoever on your relationships with [\_\_\_\_\_] and you may choose to withdraw from the study at any time, including partway through the interview.

To reimburse you for your time and effort to participate in the interview we are offering a \$20 ColesMyer gift voucher which will be given on the day at the end of your interview. Your proposed interview is expected to take about one hour. To register your interest in taking part in the interview simply reply to this email with your preferred contact details (see above) and I will contact you to book a suitable time to meet you. If no response is received you may also receive a brief phone call within the next 2 weeks.

Attached to this email is an information sheet about the project, a consent form and an independent complaints form. These will also be provided at the proposed interview. If you need any further information you may contact the project co-ordinator, Alessandro Lovat, at the School of Education on weekdays on 8313 0490 or via email, [alex.lovat@adelaide.edu.au](mailto:alex.lovat@adelaide.edu.au).

Thank-you for your consideration and for those deciding to participate, thanks again.

**Alessandro Lovat,**

PhD Candidate  
School of Education,  
The University of Adelaide, South Australia, 5005  
T + 61 8 8313 0490 | E [alex.lovat@adelaide.edu.au](mailto:alex.lovat@adelaide.edu.au) |

**Dr. Igusti Darmawan,**

Senior Lecturer  
School of Education  
The University of Adelaide, South Australia 5005  
T +61 8 8313 5788 | E [igusti.darmawan@adelaide.edu.au](mailto:igusti.darmawan@adelaide.edu.au) |

## Information Sheet (Interview Component)

### Factors contributing toward attrition for students entering a [ ] university through new VET entry pathways

#### Purpose of the study

The purpose of this study is to evaluate theoretical factors that in past studies have been shown to influence university students' decisions to withdraw from their undergraduate studies. Various factors: social integration, institutional commitment, a student's level of confidence and their academic efficiency in terms of effort and perceived performance will be evaluated. This study will assess the amount of influence that these theoretical factors have on students entering a [ ] university through new VET entry pathways. This project has full approval from the University of Adelaide's Human Research Ethics Committee, (HP-2013-110).

Student (past & present) participants taking part in an interview component of the study will be invited to:

- Consent to participate in this study
- Complete a consent form
- Travel to the University of Adelaide for the interview
- Be interviewed for about one hour
- Respond to questions regarding their experiences and how these have impacted on their decisions to either stay or to take a break or to withdraw from their studies at [ ]

#### Possible benefits of the Study

Student participants may receive some benefit in the form of deeper reflection about their experiences and their decisions on whether to continue or discontinue or possibly transfer from their university studies at this university. However the major benefit of this study is to gain an understanding of how a number of possible factors influence students' decisions to continue their university studies, with particular reference to students entering via new VET pathways. This understanding will facilitate an increased understanding of the diversity of students' reasons for continuing or discontinuing their studies after entering via new VET entry pathways. The study will enable policies to be put in place that ensure the best possible outcomes for students from a diversity of backgrounds. These benefits however are in no way assured.

#### Withdrawing from the Study

Student participation is entirely voluntary and any participant can withdraw at any time, even part way through the interview, without prejudice. Participation or non-participation (including withdrawal from the study) will not in any way affect the student relationship with the university in question. Students can withdraw at any time by simply contacting the project coordinator, contact details below, and stating their wishes to withdraw from the study. The project supervisor will then remove and destroy the collected information from that participant.

#### Foreseeable Risks and Adverse Effects of Student Interview Participation

Travelling into the city to attend interviews at [ ] may be inconvenient. Student participants could feel discomfort answering questions during the interview relating to their academic and social experiences whilst studying for their undergraduate programs at the university in question. Any discomfort will be minimized as the questions are broad and open and can be changed or avoided if need be. If student participants wish to withdraw from the study at any time without prejudice, even in the middle of, or after participating in the interview, they are able to do so and lodge a complaint with the Human Research Ethics Committee if they think it is necessary. Students may also avail themselves of the counseling services at [ ]

[ ] details of which can be accessed by the following link:

[ ]

### **Collection, Use and Publication of Interview Information Arising from this Study**

Interview data will be recorded and transcribed into a word document by the PhD student Alessandro Lovat. The data collected will be used to consider only the influence in terms of the factors influencing students' decisions to continue or discontinue their university studies at a [redacted] university. Results and findings from this study will form part of a PhD dissertation for Alessandro Lovat. There are plans to publish journal articles arising from the results of this study. If student participants wish to access study results, including transcripts of their own interview, and findings or resulting publications they can contact Mr. Alessandro Lovat (contact details below). Findings are expected to be shared with the university in question, without revealing any identification of individual participants. Results are expected to inform policy in terms of improving access and participation to the university via alternative pathways. Details of university policy regarding this can be found by following the link:  
[redacted]

### **Storage and Access to Information Arising from this Study**

All data will be stored on a secure University server, and will be accessible only to the principal researcher, Mr. Alessandro Lovat, involved in this study (contact details below)

### **Confidentiality and Anonymity of Interview Responses**

Anonymity and confidentiality of responses will be maintained throughout the research process. All responses will be treated with total confidentiality. In any reporting or discussion of findings participant identity and that of the university will remain anonymous. However, the project may engage a relatively small sample size (around 10 to 20), in which case absolute anonymity may not be guaranteed, since the identity of some respondents may be recognizable to some readers due to their comments and ideas. Nonetheless, the actual identity of participants will never be revealed in the resulting PhD dissertation, any resulting publication or in any sharing of information with the university in question.

Contact:

Mr. Alessandro Lovat  
PhD Candidate  
Email: alex.lovat@adelaide.edu.au  
School of Education, University of Adelaide  
Level 6, Nexus 10 Pulteney Street.  
Phone: 8313-0490  
Mobile: 0410010508

Dr. Igusti Darmawan  
Senior Lecturer  
Room 8.34, Level 8, 10 Pulteney St  
School of Education  
The University of Adelaide  
South Australia 5005  
AUSTRALIA  
Ph : +61 8 8313 5788  
e-mail: igusti.darmawan@adelaide.edu.au



## Interview consent forms

### Human Research Ethics Committee (HREC)

#### CONSENT FORM

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Factors contributing toward attrition of students entering a <input type="text"/> university through new VET entry pathways
Ethics Approval Number:	HP-2013-110

2. I have had the project, so far as it affects me, fully explained to my satisfaction by the research worker. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project it has also been explained that involvement may not be of any benefit to me.
5. I have been informed that, while information gained during the study may be published, I will not be identified and my personal results will not be divulged.
6. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University now or in the future.
7. I agree to the interview being audio/video recorded. Yes  No
8. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

#### Participant to complete:

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

#### Researcher/Witness to complete:

I have described the nature of the research to \_\_\_\_\_  
(print name of participant)

and in my opinion she/he understood the explanation.

Signature: \_\_\_\_\_ Position: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix 5 Proposed interview schedule

### Proposed Interview Schedule

Factors contributing toward attrition for students entering a  university through new VET entry pathways

#### **Overview**

Guided by phenomenological and narrative approaches (Shank, 2006), these semi-structured interviews will, to some degree, be shaped by the progress of the interview and the value of data as it arises. However, it will broadly follow a chronological format, beginning with students' background, family and current academic status, then moving to their experiences in their undergraduate programs at the University of Adelaide in particular during their first active year of enrolment at the university, then shifting to their plans/aspirations for the future.

The phases and questions related in part 3 of this schedule will change according to whether the student has either continued or discontinued their studies at the university.

#### **Part 1 – Basic information**

[Begin with a broad outline of the purpose of the project, reassurance of anonymity and request for honest answers. Outline chronological structure of interview but also emphasize semi-structured nature and open discussion as well as narrative. Emphasize that this is not an individual evaluation]

What is your gender?

What is your age?

Are you currently employed?

What are your living arrangements?

What language/languages do you speak at home?

#### **Part 2 – Background**

Do/Did your parents have any tertiary education? Can you tell me more about what you know of their formal learning experiences? What about your wider family?

[If not] tell me more about the lives of your family, starting with your parents. Where did they work?...

What was/how did you experience school?

What year level did you complete at High School?

If prior to year 12, Why did you leave at that stage? Can you tell me more about your feelings or experiences at this time? Do you remember any particular experiences that are linked to this time of your life?

Did you have any friends that planned to go on to tertiary education? [If not] what did they do after school? Have you kept in touch with any of them?

Tell me about your VET/TAFE qualification(s)? When did you start? What did you study? When did you complete your VET studies?

Did you have any friends that planned to go on to tertiary education? [If not] what did they do after VET college? Have you kept in touch with any of them?

How did your VET studies prepare you for your university undergraduate studies?

Did you attend another university before coming to this university? If so, why did you discontinue your studies at this first university?

**Part 3a – Early Experiences during undergraduate studies at  (for a continuing student or one that has completed their undergraduate degree)**

When did you start undergraduate studies at the university?

Were you full time or Part Time? How did you decide this?

What were your living arrangements just before and just after you started your undergraduate studies at the university?

How did you first hear about ?

Why did you choose to come ?

What program(s) did you enrol in?

Did you receive any credit for your VET studies? (If yes....tell me about the process, how did you find out? How was the application for credit process like?)

What goals did you have in mind when you first enrolled in your specific undergraduate studies ?

How did your family or friends respond to your decision to go to Uni to study your subject ? Tell me more about when you told them, or any discussions you had. Did their viewpoint change as your undergraduate studies progressed?

Were any your friends or peers from either your High School or VET college also starting at the university? Did you keep in contact with them?

Did you actively start your studies after enrolment? (if Yes...continue, if No go to discontinuing section 3b see below)

What were your first experiences of the university?

- The application process/completing the form/interactions with the University admission staff;
- The first class;
- Getting to know the physical layout of the campus;
- First using University support services;
- Completing your first assignment, getting feedback;
- Adapting to and managing a new schedule of attending class, lectures, completing readings, preparing assignments;
- Communications and interactions with teachers of your courses;
- Learning, collaborating, working in a group with fellow students;
- The language used in the classroom and when completing written and oral assignments;
- Differences between your VET and university learning experiences;
- Learning new and possibly challenging things.

What were some of the key moments in the first year of your undergraduate studies for you? Something that made an impact on you (can be either positive or negative)?

Did you complete your first year studies at the university? (If yes ...continue, If No go to discontinuing section 3b below)

What did you enjoy most about your first year studies?

What did you find most challenging about your first year studies? How did you address these challenges?

What do you think are/were your personal attributes or qualities that most helped you to manage your challenges at this time?

How had your previous life experience, such as in work, in learning, in language, in culture, influenced your progress through your undergraduate studies? Please give details where possible.

Can you provide 3-5 adjectives that could describe your feelings during the early stages of your undergraduate studies. [Expand on these adjectives – what where, how. Elicit narratives which express experience. Bring in earlier discussions about family and community to highlight changes/developments in their response.]

Can you tell me a story which symbolizes your early experience of ?

Did your friends/peers from your VET/TAFE days help you with your university adjustment?

Did /Have you make/made new friends at University? Tell me about them. Are they similar to you, what kinds of things did/ do you do together?

Did studying at this university have any impact on your family life or your outside friendships? Tell me more about that.

Once you were 2 years into the studies, did things change or develop in any way? Tell me a more recent story that symbolizes the mid-point of your undergraduate university experience. (this would be a good point to determine if the student transferred to a different program)

[Rinse and repeat for end of year 2]

Have you completed your undergraduate studies? If so When?

**Part 3b – Early Experiences during undergraduate studies at**  **(for a discontinuing student)**

What was the main reason for discontinuing your studies ?

What were some of the other reasons that helped you to decide that it was better to stop at ?

Do you have plans to return?

Some people believe that experiences at university are positive even when a student does not complete a degree, what do you think?

#### **Part 4 – future aspirations**

Do/did you see the undergraduate studies as important to fulfilling the goals which you outlined for yourself in 3 above?

Given where you are right now, what are your plans and dreams for the future? Have they changed since you studies at the university?

Think about where you were before starting your undergraduate studies at  and where you are now. What are the differences? Can you give me 3-5 adjectives that help to describe the differences?

[Bring discussions of family and community into the present.]

What are your plans for the future?

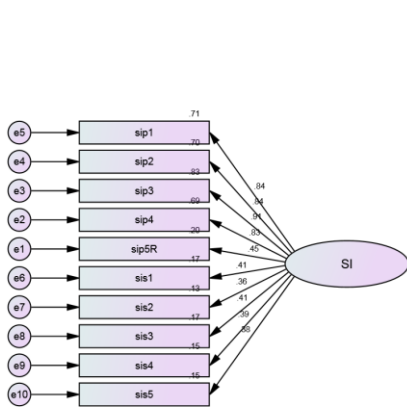
#### **Part 5 – A Phenomenon**

If you found out that students entering the university through a VET pathway were discontinuing their studies at a greater than 'average' rate why do you think this could be?

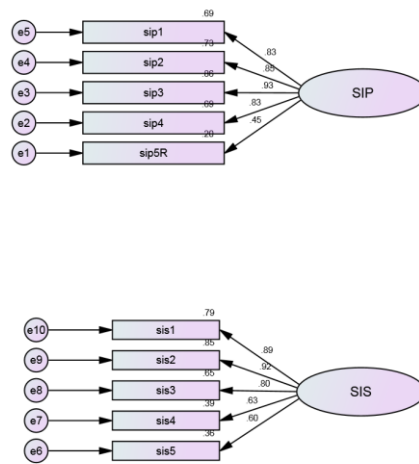
Is there any anything else you'd like to tell me regarding the topic of our discussion today?

## Appendix 6 – Social Integration Models

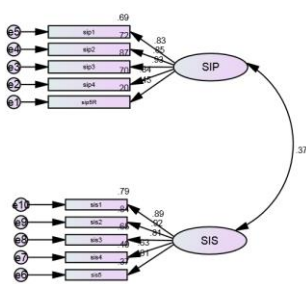
CFA undertaken for four different Social Integration model types: (a) a one-factor model, (b) a two-factor model with uncorrelated/orthogonal factors, (c) a two-factor model with correlated factors, (d) a hierarchical model.



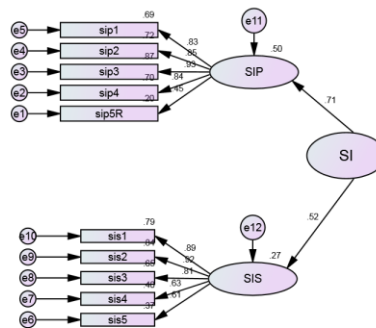
(a)



(b)



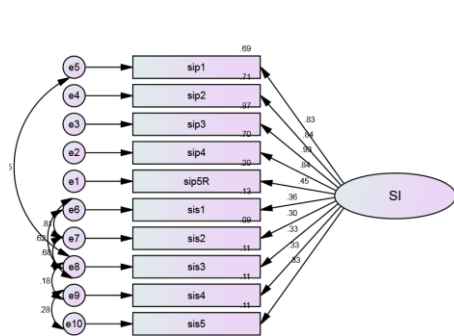
(c)



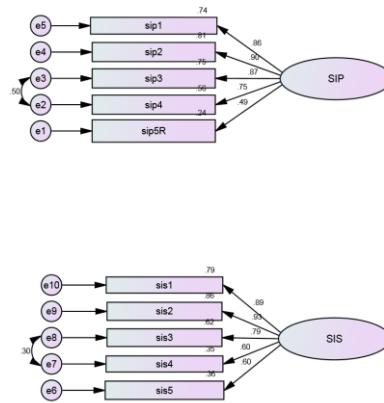
(d)

## Appendix 7 – Social Integration Modified Models

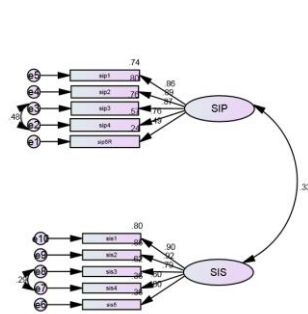
CFA undertaken for four different modified (with error correlations included) Social Integration model types: (a) a one-factor model, (b) a two-factor model with uncorrelated/orthogonal factors, (c) a two-factor model with correlated factors, (d) a hierarchical model.



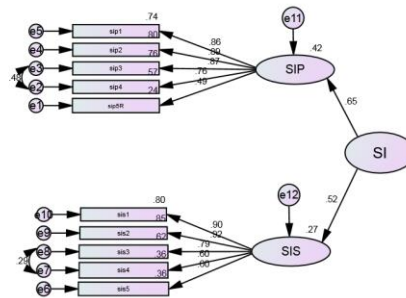
(a)



(b)



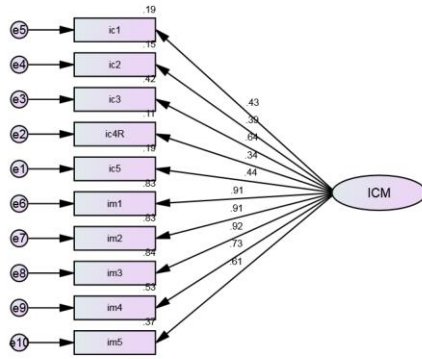
(c)



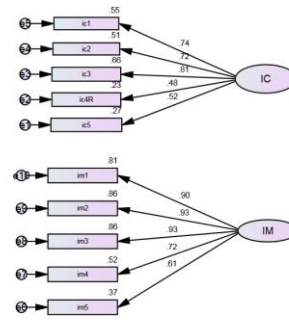
(d)

## Appendix 8 – Institutional Commitment and Membership Models

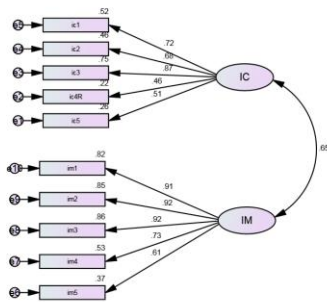
CFA undertaken for four different Institutional Commitment and Membership model types: (a) a one-factor model, (b) a two-factor model with uncorrelated/orthogonal factors, (c) a two-factor model with correlated factors, (d) a hierarchical model.



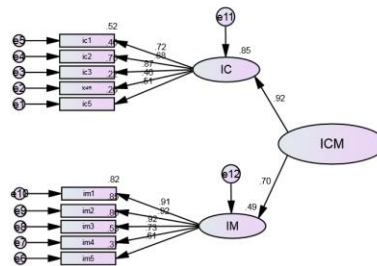
(a)



(b)



(c)

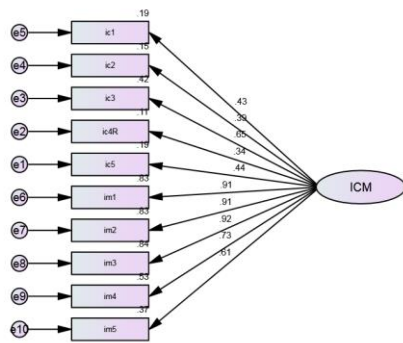


(d)

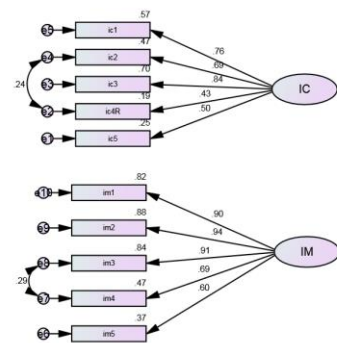


## Appendix 9 – Institutional Commitment and Membership Modified Models

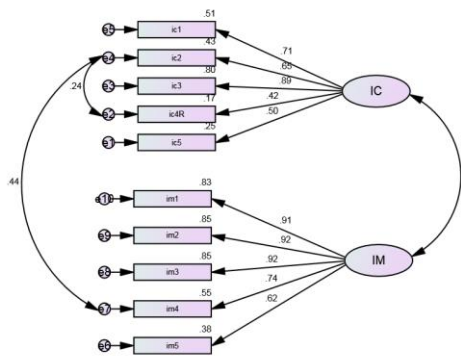
CFA undertaken for four different modified (with error correlations included) Institutional Commitment and Membership model types: (a) a one-factor model, (b) a two-factor model with uncorrelated/orthogonal factors, a two-factor model with correlated factors, (d) a hierarchical model.



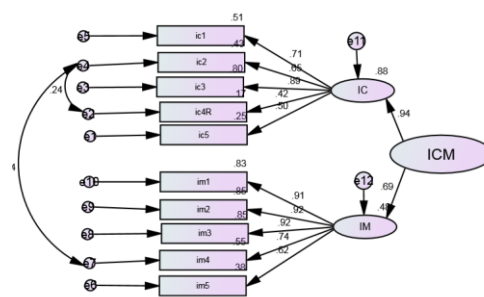
(a)



(b)



(c)



(d)