Victoria University of Technology

Faculty of Human Development

Department of Education

AN INVESTIGATION OF COMPARATIVE INDICES OF BACKGROUND OF TERTIARY ENTRANTS AGAINST ACADEMIC PERFORMANCE

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Preface

This thesis has been structured in such a way as to report, in a logical sequence, on several aspects of a program which were conducted in parallel. To achieve this, chapters which deal with specific areas of the work have been grouped into sections which more clearly delineate the structure one might expect to find in a dissertation of this type. Material from several published articles and conference papers has been incorporated into a number of the chapters.

Key terms used throughout the thesis, which have a specific meaning in relation to the work described, appear with brief definitions or explanations in the glossary at Appendix 1. The first occurrence of each such term in the body of the thesis has been set in italic type.

Adopting a convention favoured by some research journals in the field, the diagrams, graphs and tables included in the text of the thesis have been described as "figures" and have been included in a single numbered series throughout the thesis.

Data within the thesis are, for the most part, derived from integers (eg numeric marks) and are predominantly comprised of means and standard deviations. In reporting such data, attention must be given to the requirement for a balanced approach to precision (Campbell, 1974). The convention adopted for this purpose is the addition of a single significant figure at each data iteration. Thus the first

iterations of derived data (eg arithmetic means) add one significant figure and (where the source data are integral) are reported to one decimal place. Similarly, the second iterations of derived data (eg standard deviations) add a further significant figure and are reported to two decimal places. A notable exception is enrolment load data which, in line with the requirements for reporting student load to the Commonwealth, (Department of Employment, Education and Training, 1992) are provided to three decimal places.

The thesis describes the application of a hybrid methodology wherein aspects of quantitative research are fused with interpretive analysis more commonly associated with qualitative studies. This has been done in the interests of simplicity and transparency, and with a view to making the substance of the arguments and the research more accessible. Moreover, in keeping with the desire for accessibility, the thesis has been expressed in less formal language and in a more relaxed style than is frequently to be found in accounts of academic work.

One facet of the hybrid methodological approach is that data are organised, combined and presented for discussion using commonly understood devices (weightings, arithmetic means etc) rather than being extensively treated by the application of statistical tools. Graphs and charts have been employed for presentation of large amounts of data in logically organised and understandable ways, and as an aid to their interpretation.

A conservative approach to the estimation of significance has been taken, with most attention being given to variations in aggregated data of a magnitude several times greater than statistically significant levels. For this purpose, estimates of significance applied to variations in weighted average marks (and related values including the success index) have been based on benchmark calculations using a notional sample size of 25 and confidence levels of 95%. From these parameters, the t-test has been applied to produce a null hypothesis for mean variations of less than 0.4. This benchmark has been used to determine significance for arithmetic means of like data for all groups of 25 or greater, so that for the most part, the need to re-apply statistical tests of significance throughout the analyses has been minimised. No conclusions have been drawn from data where the sample size was less than 25, though in several cases the data have been included for the sake of interest and completeness.

At various points throughout the thesis, the methods employed and results obtained are compared with those of other studies and other researchers. These comparisons are incorporated into the body of the document, adjacent to relevant discussion or analysis. In keeping with the structure of the thesis, therefore, an overview of related research (both Australian and international) is provided in the literature review. Moreover, a discussion of methodological relationships between this and other studies is contained within Section 2, and comparisons of the findings of the explorations and

analyses of the data are incorporated within the relevant chapters in Sections 4 to 6.

The writer was fortunate in being able to draw on a professional and academic background which provided skills in computing and database programming, enabling the program to embrace the design of applications specifically conceived for its purposes. Brief technical details of the software designed throughout the program may be found in the Appendices.

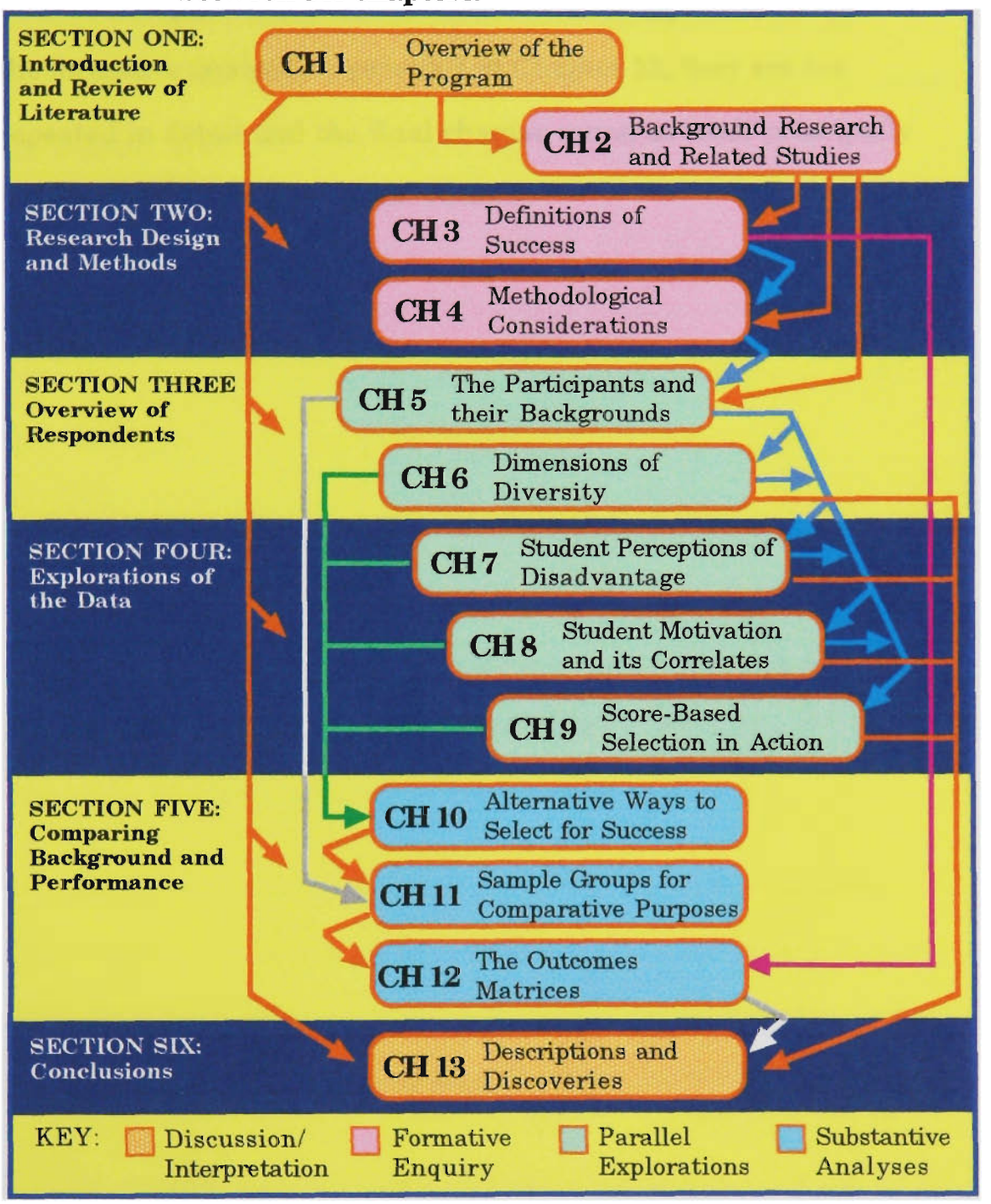
Also reproduced in the Appendices are the surveys, some supporting data and graphs of data which are relevant or of interest, but not pivotal to the analyses described within the body of the thesis. In each case, appended materials are explained and referred to within the relevant chapters.

Some indications have been provided within the chapters as to how their contents relate to the overall process of the program. The schematic provided below, however, tracks the developing themes covered within the body of the thesis and illustrates the inter-relationship between the parts of the thesis. The arrows indicate the developing thread, wherein each chapter draws upon, or depends upon, underpinning analysis in those which feed it.

The thesis has been divided into sections, as shown at Figure (i) below, which may be regarded as representing the major phases or components of the work. Within the sections, discussions of relatively self contained subjects and aspects of the work are grouped into

chapters, which nevertheless inter-relate and develop a line of argument throughout the thesis.

Figure (i). Structure of the thesis showing inter-relationships between the chapters.



In particular, the relationship between Chapters 5 to 9 inclusive is important, as these chapters describe a series of parallel explorations which build upon each other and inter-relate in such a way as to provide the foundations of the substantive analyses which follow.

Where numerous observations or conclusions have arisen from the analysis reported within a given chapter and pertain primarily to that chapter, the conclusions have been provided at the end of the relevant chapter. Although a brief overview of conclusions specific to the formative analyses is provided at Chapter 13, they are not repeated in detail and the final chapter concerns itself principally with overall findings and conclusions.

Acknowledgments

The assistance of Victoria University of Technology in providing access to enrolment statistics and student records data for the program is gratefully acknowledged, as is the University's generous cooperation with and patronage of the project.

The support of the Staff Development Unit at Victoria University of Technology and of the Director of Student Affairs and his staff in providing the required flexibility to allow the final stages of drafting this thesis to occur are greatly appreciated.

Thanks are due to the Department of Education at Victoria University of Technology for its broadly based support for the project, both material and moral, and for the unstinting contributions of senior staff and fellow research students to formative debates, developmental processes and the refinement of drafts.

I would like to make special mention of my supervisor, Professor John Wilson and co-supervisor, Associate Professor Robert Taylor whose guidance, support, wise counsel and unflagging friendship have sustained the program throughout five years.

Thanks are also due to the several other friends and colleagues who lent assistance with preparation of materials, data entry, proof reading and typing at various stages of the program.

for my children, Aris and Drue
whose patience and love have been
a constant presence

Abstract

This thesis describes a study of new level one undergraduate entrants to higher education courses at Victoria University of Technology in 1993 and 1994. Approaches to the study of student achievement and selection are reviewed and alternatives are investigated. An integrated model for evaluation of success, drawing upon varied approaches adopted in previous international studies, is described and its application documented.

Based on enrolment data, survey data and the first year academic results of 3,117 participants in the program, the outcome of an analysis of the success and backgrounds (cultural, social, economic and educational) of these students is described.

The study suggests that conventional wisdom based on studies of more traditional paths to higher education taken by a relatively homogenous and educationally privileged group, has little bearing in the current context. Instead, it is argued that recruitment and selection for undergraduate admission should be more broadly focussed to encourage applicants without relevant study/work experience, that tertiary entry scores need no longer be regarded as the most accurate or effective way to select for success and that there is scope for further development of other approaches to selection, that prerequisite studies may be unnecessary and undesirable and that course structures should not simply allow, but require that students take subjects or supervised work experience in more than one field.

Executive Summary

This thesis provides a detailed report on the conduct of an investigation of the relationship between the background of entrants into higher education undergraduate courses at Victoria University of Technology (in Melbourne, Australia) and indices of academic performance based on first year results.

Purpose and Objectives of the Program

The program of research described in the thesis set out to identify and conduct novel comparisons between groups of students selected according to key background characteristics and their success in undergraduate studies, with particular attention being paid to non-traditional backgrounds. In support of these aims, the program sought to develop a mechanism for comparison of the academic performance of disparate groups and to draw from this, a matrix of equivalence for students' background characteristics.

Finally, the program sought to relate this new approach to the investigation of tertiary selection and success to the body of studies of tertiary entrance and progression undertaken throughout this century and to reflect upon the broader ramifications of the findings in the context of current policy and practice in the structuring and delivery of undergraduate education in Australia.

Scope of the Program

The program entailed a study of a range of data about two cohorts (1993 and 1994) of new first year students in the higher education undergraduate courses at Victoria University of Technology. The input information which provided the basis of the investigation included socio-economic, educational and personal historical, academic and self-assessment data.

Limitations of the Program

It should be noted that the program operated within limits which include the following:

- The participants in the study were all enrolled at a single institution (Victoria University of Technology);
- The data on student success were drawn from students' first year results and may not, therefore, have provided a balanced assessment in all cases;
- The investigation was conducted across all fields of study, and differences between fields of study were not explored.

In Synopsis

In the first instance, the myriad studies into the academic performance of entrants conducted this century are reviewed and several recurrent themes are noted, including the pervasive preoccupation with year twelve (secondary) scores in various forms as correlates of success. As part of this process, competing definitions of success (and mechanisms for its measurement) are discussed and an integrated measurement instrument, termed the

'success index', was developed. The index combines data of three types – progress rates, marks and students' self-assessed aspirations – into a single measure.

In all 5,402 new level one undergraduate students were approached, being 2,469 in 1993 and a further 2,933 in 1994. The resulting response was 1,545 and 1,572 in 1993 and 1994 respectively, making a total of 3,117. This in turn yielded the voluntary participation of 3,086 students completing first year studies. Survey data were collected from each of these participants and matched with enrolment and results data. Software was designed and programmed to facilitate data access and analysis. The data were then subjected to rigorous checks and analyses to confirm that in each year the participants were a representative sample of the population of entrants, to ascertain data integrity and consistency, to develop a thorough working understanding of the data and to trial the success index and comparative methodology. Preliminary analyses produced several findings and noteworthy insights leading to several parallel explorations within the program, and these were the subject of papers and journal articles. Analyses took the form of descriptive analysis based on profiles using percentages, means and standard deviations.

The preliminary findings included:

- the identification of language difficulties (as perceived and indicated by students themselves) as the single outstanding barrier to participation and success of under-represented groups;

- an inverse relationship between the size of an expatriate cohort and the integration and subsequent achievements of its members;

- the linking of motivation to age, but to no other identifiable factor, and the confirmation of the links of motivation and age to success;

- the demonstrable impact of support programs on students who self-identify as disadvantaged at the time of enrolment and the benefits to them, as against the negative outcomes for students whose perceptions of the difficulties they faced did not actualise until later in their first year;

- the drawback to the (again confirmed) predictive value of the use of scores for selection of undergraduate entrants is that their use was seen to mitigate against the attainment of access and equity goals;

- that, despite popular perception and media rhetoric, score-based selection now accounts for a minority of admission decisions and that the outcomes for entrants admitted on other bases matched or exceeded those of score based entrants overall.

For the main analysis the data were then grouped, drawing in part upon the findings of the parallel analyses indicated above, into sixteen trial sample groups selected according to combinations of key background criteria. The composition of these groups was analysed and the success indices of the groups were then plotted against the performance of all participants to produce a comparative matrix.

A clear differentiation of the mean success indices of the sample groups into three clusters was observed, which could best be characterised as outstandingly successful, above average and average respectively. It was established that known correlates of success such as tertiary entry scores, age, motivation and gender could not account for the performance of the highest cluster of groups. This provided the impetus for an analysis which isolated a small set of criteria for high success. At odds with conventional wisdom, these included a surprising mix of related and unrelated work and study backgrounds, thus challenging prevailing notions about appropriate backgrounds for tertiary entrants and appropriate techniques for course design and delivery.

Major conclusions, implications and inferences arising from the application of the comparative success matrix include:

- that recruitment and selection activities for undergraduate admissions are frequently too narrowly focussed, and individuals whose backgrounds are not related to the field in which they aspire to study should be actively encouraged, rather than discouraged from applying for admission;

- that efforts should be turned to the purposeful development of non score based entry criteria and procedures and that tools such as the comparative matrix approach might be employed as an aid in the identification of alternative, valid selection criteria;

- that prerequisite studies for undergraduate courses should no longer apply, but should be replaced by bridging options within the early semesters of the program;

- that students whose backgrounds before admission to undergraduate courses are mostly or entirely within related fields should be required to undertake supervised work or component studies in areas outside the discipline focus of the course to provide them with some of the breadth of conceptual base and contextual vision that some highly successful students from non-traditional backgrounds already have.

Although these findings have important implications, the extent to which they can be generalised has not been firmly established, given that this study examined only two successive cohorts within a single institution. Moreover, the analysis was not applied separately to individual fields of study, disciplines or courses. The desirability of further work and comparable analyses within Victoria University of Technology, across other higher education institutions and within individual fields was therefore indicated.

SECTION ONE: Introduction

Chapter 1:

Overview and Structure of the Thesis

Throughout the progress of the *program* of research which is described in this thesis, aspects of the process have been the subject of group discussions, seminars and conference presentations. These instances have, on several occasions, led to material relating to one or more aspects of the work in progress being published in the form of a paper or article. Consequent upon this, six papers have been promulgated and presented at local and international conferences, and four articles have either been accepted for publication or are under review by refereed international journals. The content of several of these papers and articles has been revised and presented in the form of series of chapters within this thesis. For this reason, a number of the chapters are relatively self-contained.

In part, in order to accommodate material which appertains to a specific aspect of the research, the thesis has been divided into sections, and chapters within those sections. In this way the chapters have been grouped to show how they relate to the overall work. In addition it has been deemed desirable in a number of cases, to present data under review, analyses and interim conclusions in an integrated way before moving on to describe the next phase of analysis. This is in keeping with the structure of the thesis adopted for the aforementioned reasons.

1.1 Overview of the Program

The author has taken the liberty of assuming that readers of this thesis will find a general overview of the issues to which the body of the thesis is addressed helpful. Therefore in the remainder of this introduction, a number of aspects of the program are discussed, each being described in greater detail in the chapters which follow. One might, then, view these first paragraphs as a snapshot of the whole in preparation for a look at the fine grain in subsequent pages.

The research program which is described in this thesis was conceived and commenced in the early years of the current decade, at a time when the higher education systems in Australia, like many of those internationally, were in the final stages of a transition from an elite higher education system to a mass system. Amid this change, individual institutions such as Victoria University of Technology have been presented with questions and problems to which conventional wisdom, based on experience and research over preceding decades when the environment and objectives were substantially different, could provide few answers.

From the writer's vantage point at that time, having been involved with the selection of students at faculty and institutional level over many years, it was considered that new ways of looking at the process were needed. Increasingly, the process of selection entails comparisons between unlike quantities (proverbially, apples and pears) wherein the longstanding problems associated with making judgements between *mature age* applicants and school leavers have grown as the number of categories of applicant and the diversity

within each category increases. In addition, a desire to achieve equity in the provision of educational access was part of the founding mission of Victoria University of Technology and was and is of concern throughout the Australian higher education system and the communities it serves.

This program was, therefore, fuelled by a desire to gain new insights into the nature of equity, new ways to understand the relationship between entry and *success* and new mechanisms by which to review and manage these new complexities.

1.2 Genesis of the Program

A starting hypothesis for the program of research described in this thesis was that background is a significant determinant of success in tertiary education, and that some non-traditional backgrounds (either in experience or education) equip students equally well for undergraduate study in the tertiary system as the traditional paths of entry into higher education. It has been assumed that a process of measurement and evaluation, leading to a reference system for comparison of unlike backgrounds (both traditional and non-traditional), would serve to test the hypothesis and to provide a possible basis for further exploration and application.

One of the principal objects of the program was to provide a basis for the development of tools or benchmarks for quantification and comparison of a wide range of academic and experiential backgrounds as indicators of academic potential. Specifically, the program has been directed at establishing a *success index* for use as

a guide in the comparison of different or dissimilar backgrounds of students. The work has drawn upon existing practices developed for evaluation of selection methods, to provide a quantitative framework for the analysis of trends in tertiary admission.

A further object of the program, from its inception, was the development of a *matrix of equivalence* which will provide a basis for drawing comparisons between dissimilar attributes of applicants for admission, on the basis of the typical outcomes for previous students with like characteristics or backgrounds. One of the chief purposes envisaged for the matrix of equivalence was that it should provide a guide to the equation of conventional (eg school leaving examination results) and unconventional (work experience, trade certificates etc) qualifications/backgrounds as a basis for admission to and progression through tertiary study, and should provide a predictive model.

It is desirable that such a matrix provide a reference tool for the comparison of unlike factors influencing tertiary selection and course counselling, which will give a firm basis for analysis in terms of demonstrated prior links with academic success.

The aims of the program can be defined in two parts, where the first provides the basis for the accomplishment of the second:

i) the completion of a review of the educational history and the underlying theory behind success prediction and the identification of associated determinants. This will necessarily include conventional systems such as the *grade point average*

(GPA) prevalent throughout North America, *weighted average mark* (WAM) and *student progress unit* (SPU), measures adopted by a number of recent Australian studies, as well as the range of self assessment, curriculum specific and discipline specific quantification scales.

The purpose of this phase of the program has been the establishment of an appropriate model of discipline independent and culturally non-specific success measurement index for use in the second phase of the program. The scale of the success index used has therefore been developed so as to be meaningful in the contemporary education environment, and with a view to its being broadly accepted as a suitable measure by those whose interests lie within a variety of fields of study, in both abstract and applied learning situations. It was also intended that the success index be equally applicable at a range of levels within undergraduate education.

ii) The second phase of the program involved the comparison of data concerning the previous academic qualifications and experience of successful applicants for admission to tertiary courses with data concerning individuals' academic results in those courses, and the consequent production of a table of comparison (in the form of a matrix of equivalence) of unlike backgrounds and qualifications as success indicators. This matrix made no reference to achievement or success as such, but rather, tabulated the types and extents of applicants'

qualifications/experience in groups, allowing the drawing of comparisons between unlike groups.

The purpose of this second phase of the program was to provide a basis for investigation of the transferability of skills, as it relates to undergraduate education, particularly in light of the contemporary debates about articulation, access and recognition of prior learning.

1.3 Brief Overview

In essence the program can be described as a longitudinal study of two cohorts of higher education entrants at a single institution, following each cohort through until the finalisation of their first-year university results. The data thus obtained have provided the basis of an investigation of the relationships between factors in students' backgrounds and their success at university. These have included investigations relating to motivation, perceived disadvantage, language and cultural background.

The subjects for the study are new higher education undergraduate students at Victoria University of Technology who commenced studies in 1993 and 1994. In all, 5,402 commencing students were invited to participate in the study. Of these, 3,117 students elected to participate and provided data both directly and by authorising the release of enrolment and academic progress data from the University.

Data provided directly by *participants* were in the form of surveys which were forwarded to commencing students during their first semester of study. These surveys included questions about students' backgrounds as well as several self-assessment questions structured according to attitudinal measurement principles (Henerson et al, 1987) relating to the measurement of motivation and perceived disadvantage.

A comparative procedure was applied to establish that the survey *respondents* were a representative sample of the total cohort, and has been described previously (Cologon, 1993). This was done by applying the principle of profiling on fifteen personal, cultural and socio-economic indicators to the cohorts, separately comparing them to aggregate data on the total intake in that year. Charts which illustrate this process are reproduced in Chapter 5.

In short, the 1993 and 1994 cohorts of students participating in the study, when profiled according to background characteristics, were shown to be representative samples of the total intakes to higher education courses at Victoria University of Technology during their respective years. Since the cohorts were also of similar composition (when compared to each other), any differences between the groups in relation to individual factors or achievements and their correlates have been regarded as warranting investigation, the results of which are discussed in the body of the thesis.

Ultimately, groups of participating students chosen according to criteria which relate to various traditional and non-traditional

backgrounds have been compared and a matrix of equivalence produced, as described and presented in Chapter 12.

1.4 A Point of Departure

The reader is no doubt aware that this is not by any means the first study of predictors of academic success within higher education. Studies of students' academic achievements and efforts to identify correlations with other factors (primarily with a view to establishing predictive measures) have abounded, and are discussed in the body of this thesis. However the objects of the program of research described herein is different in a number of respects.

Firstly, there has been little agreement upon what constitutes success, and consequently little conformity in the processes by which people have contrived to measure it. But more on that in a moment.

A dominant characteristic of much of the work which has been undertaken in relation to identifying determinants of (and measures of the potential for) academic success has been its focus both on the traditional path straight from secondary school into first year undergraduate studies and on the traditional qualifications with which such entrants arrive. Such qualifications include the former Higher School Certificate (HSC), the current Victorian Certificate of Education (VCE) and their equivalents in other states and territories. Relatively little attention has been paid to other factors in the backgrounds of entrants, so that non-traditional entrants, who now form an increasingly large proportion of undergraduate intakes, have been largely ignored.

In this respect it has been the intention in framing this program, to use the end-point of preceding studies as a point of departure, and thus to build upon knowledge and experience accumulated so far.

1.5 Divergence and the Paucity of Agreement

As mentioned above, a wide variety of approaches to the measurement of academic achievement have appeared in studies which have purportedly had similar objects. Different approaches to measurement of success are frequently based on differing views as to what constitutes success, and are frequently both methodologically and philosophically opposed. This might lead the casual observer to, somewhat cynically, wonder whether the methods for measurement have in some cases been chosen because they best illustrate some point or other.

Cynicism aside, what is clear is that comparisons between the results of different studies are not aided by their application of incompatible definitions, approaches and measures. Moreover few attempts have been made to establish a compromise position; a middle ground between the opposing views of what success is and how it might be measured.

This program seeks to take a wider view of the debate(s) concerning success, and to produce a measure which takes cognisance of the various competing standpoints, holds validity and remains defensible across a broad spectrum.

1.6 The Opening Up

During the course of the program, which commenced formally in March 1992, a number of related studies were under way elsewhere, and several of these have been of assistance in clarifying aspects of the work of this program. Moreover, the rate of change of the higher education system in Australia has remained unrelenting. It is pleasing to note that the focus of the program is probably more relevant now than it seemed likely to be at the time it commenced.

One of the interesting developments during the intervening years since the program began has been an increasing focus upon equity, and the commissioning of several reports and studies which provide a more thoughtful framework for strategic management of equity in selection and admission than was formerly available (eg Martin, 1994). These various developments will be discussed further, however they point to both the continuing relevance and potential significance of the findings of this program.

As such, the work which is described here can be viewed as a part of a larger process of opening up within the higher education system, and perhaps within the wider community. In order to sustain a new awareness of the shared humanity of an ever more cosmopolitan world, new structures are required. In higher education, first and foremost, new ways to recognise formerly unseen similarities are much in demand.

Chapter 2:

Background Research and Related Studies

Although modern universities are part of an established tradition which contributes to the advancement of knowledge today as it did in Bologna and Paris almost a thousand years ago or for that matter, in the Academy of Ancient Greece, the twentieth century has seen a transformation in the status of university education. In Australia, such changes have been incremental throughout the twentieth century, so that at the close of almost every decade the shape of the higher education sector has been appreciably altered, and never more so than in the most recent three decades (Maslen & Slattery, 1994). Such changes in the Australian higher education system mirror those which have been occurring internationally (Hearnden, 1973; Boyd & Smart, 1987). In a few cases comparable issues, problems and concerns are arising in different parts of the globe, however there is no source of established wisdom to guide universities through current changes.

One of the most notable changes in Australian higher education in the last two decades has been the completion of its transformation from an 'elite' to a 'mass' system (Karmel, 1991), and with it, moves towards a remarkably different population profile amongst those who study and teach within Australian universities (Ball et al 1993). With these changes, the question as to who goes to university and who does not, and why, is no longer a minority concern but has become a feature of wide attention in the press and in the community.

The increasing focus on the composition of the group of students who are successful in securing themselves a place in our universities each year is not merely a popular concern. Social researchers, political analysts, and State and private funding bodies have shared the concerns of the community (Martin, 1994).

2.1 Competition for Admission

In Australia, selection and admission of local students to university courses is competitive, and courses throughout the higher education system are subject to intake quotas. This has not always been the case; until the early decades of the twentieth century admission to university courses in Australia was subject to entrance examinations which primarily served the purpose of establishing minimum entry standards, but was not subject to quotas (Thomas, Beeby & Oram, 1939).

The first course quotas in Australia were imposed in 1942 as a consequence of the desire to maintain stability in spite of population shifts associated with the war effort, in light of the inclusion of students in certain disciplines in the 'reserved occupation' class and as a consequence of Commonwealth funds being made available for financial assistance to students in these courses (Sanders, 1948). More general quotas followed with the post-war expansion of the university system to accommodate returning servicemen. Competitive selection, which has meant that some qualified applicants are denied entry to the course of their choice, has operated since that time. Although recent legislative changes will provide

universities with increased flexibility to admit limited numbers of full-fee paying local students from 1998, quota restraints will still govern the admission of Australian students to all university courses.

In the context of competition for entry and of the use of public funds to support a burgeoning higher education sector, a considerable focus on the efficiency of the institutions which educate has been sustained across the four decades since the Committee on Australian Universities was given its brief in 1956 (Murray, 1957). Throughout much of this time, Australian universities have been under pressure to admit those students whom they could demonstrate to have the greatest chance of succeeding in and graduating from the courses in which they enrol. This, in turn, has focussed attention on the efficacy of the methods by which applicants competing for admission to higher education courses are selected: a preoccupation with the starting point of the process. Moreover, some scrutiny has also been reserved for the completion and graduation rates and employment and career outcomes for university educated students.

As is well understood, the fates of the many students who enter undergraduate courses in higher education institutions in Australia and internationally each year, vary widely. In fact, several thoroughgoing surveys of the outcomes of tertiary study have been conducted in recent decades (Heywood, 1989). Some students succeed (by whatever measure) and others do not; thus far most people agree, and this includes the many researchers who have concerned themselves with questions about students' achievements. There is

limited agreement, however, as to the extent to which academic performance, as reflected in students' grades, is relevant to success and even as to what success is.

2.2 In Search of "Success"

In part, definitions of success have been context dependent, and this is to be expected. For example, for the purposes of a study directed solely at identifying ways to reduce the failure rate of undergraduate students, it seems reasonable to accept the limited definition of success as passing everything (Magin, 1993). On the other hand a study of the employability of graduates may count success in terms of graduate starting salaries (Guthrie, 1990). For yet other purposes neither approach to the measurement of success would be appropriate or meaningful.

A significant proportion of studies of higher education students' performance have been concerned with identifying relationships between past or present factors and their correlates among academic outcomes (McDonell, 1975). Some of these studies have been directed toward prediction, but all have, of necessity, established a working definition of success to enable comparison.

The aim of this program is to examine a variety of approaches taken to evaluation of student success, to establish a view of their underlying assumptions and their contextual relevance with a view to proposing an integrated model. The purpose of such a model will be to provide a basis for measurement of success which is more broadly based than those which have been used for studies principally

concerned with prediction, and which provides for continuity both conceptually and in terms of comparison between the results of different studies.

2.3 Origins of the Prediction Focus

The attention researchers have paid to higher education students' academic performance throughout this century has, in part, been a response to the changing social and economic context arising from the onset of the technological revolution (King, 1971), and has been driven by expansion of higher education throughout the industrialised world. In Australia too, the expansion of higher education has been extraordinary. Since the 1930s, participation has risen from around one percent to around forty percent, and it continues to rise (McCallum, 1990). Between 1966 and 1986, the proportion of the Australian population holding university degrees increased by a factor of 3.37 (Australian Bureau of Statistics, 1989) and since 1986 the total number of students enrolled in higher education in Australia has increased by some seventy five percent (Department of Employment, Education and Training, 1995).

Widespread interest in refining selection techniques and enhancing the teaching of university students, in the earlier part of the century, stemmed from a recognition of the need to cope with spiralling demand and the vast expansion in the number of institutions, courses and places available in the years which followed the second world war (Sanders, 1958). Problems associated with expansion were not confined to that period, however, and the changes foreshadowed

in Australia by the then Federal minister responsible for higher education in 1987 included an increase in breadth (via increased participation of under-represented groups), as well as an increase in the overall size of the higher education system (Dawkins, 1987). This review leads to the observation that, as the participants in higher education become more diverse, the search for single, simple cognitive correlates of success becomes increasingly irrelevant (Cologon, 1995a).

Studies of prediction have not been limited to the search for links between test results (from previous school examinations of various kinds and also from a range of aptitude, intelligence and/or personality tests) and academic outcomes for higher education students. A number of significant studies of non-academic and non-cognitive factors and their relationship to academic performance have been conducted, including early work undertaken by Australian researchers in the 1960s at the University of Melbourne (Anderson, 1961) and at the University of Western Australia (Flecker, 1963). Since that time, a number of studies have been conducted which extend the scope of this kind of work (Entwistle et al, 1971; McDonell, 1975; Roe et al, 1986; Trigwell & Prosser, 1991), and their contributions to the methodological debate have been an important sub-text to the over-riding concern with prediction.

2.4 Other Related Studies

In quantitative studies of learning and assessment which have been conducted internationally throughout this century, researchers have

explored methodologies for measurement of student success. Considerable attention has therefore been given to the identification of performance indices for higher education students. Recent examples include a study in which it is proposed that students' academic attainment be evaluated against data about their cultural, class and language backgrounds (Agor, 1990), and another wherein indicators of performance are considered in the context of course quality and it is proposed that students' success be rated so as to provide a determinant of quality in the educational environment (Yorke, 1991).

Recently, as part of a discussion of methodological issues attendant upon a longitudinal study of students in Slovenia, a comprehensive survey of the use of success indices in educational research was published (Stergar and Lapajne, 1990). In this work, the researchers make a clear distinction between efficiency and success on the part of students. This leads to the proposition that an efficient student is one who achieves high grades and progresses/completes rapidly and a successful student is one who develops, learns and matures. They contend that the efficient student is not always successful and vice versa. Stergar and Lapajne advance the view that educational research has focussed principally on measuring students' efficiency and they explore some facets of contemporary work in this area.

The methodological review in the Slovenian study (referred to above) points to six approaches to the measurement of students' efficiency: ratio of graduates to entrants within a given time lag; rate of transition between levels; grade point averages; course transfers (secondary commencements); completion times (course duration

against minimum) and the inverse of attrition rates. A review of recent papers in which student attainment has been measured reveals several fundamentally different approaches to measurement which extend the list. These include: the use of students' perceptions of their success as its sole measure (Farmer et al, 1991), a focus on students' choices of curriculum activities to assess academic attainment, in the context of the view that student success is in turn a measure of teaching performance (Thomas et al, 1991) and use of the results of a single multiple choice test directed at gauging a range of competencies without reference to conventional assessment results or other peripheral data (Beckwith, 1991).

It is noteworthy that, to the extent that there is a valid distinction between the successful student and the efficient student, as drawn by Stergar and Lapajne, this distinction must arise from an inadequacy of assessment methods to adequately measure development, learning and maturation. Entwistle and Wilson (1977) contend that a student's academic performance is an index not only of her/his own ability, but also of the effectiveness of the teaching he/she has received. One could add that a student's performance is an index of the quality of the assessment undergone, and more particularly, of the match between teaching and assessment in the course, overall.

At the simplest level, quantitative studies of learning and assessment constitute explorations of the various methods for calculation of aggregate results and grade point averages, and discourses on the merits and demerits of the use of school based grades and composite scores as predictors of success in subsequent courses (Miller, 1970;

Bloom et al, 1971). Some studies, however, have used appraisals of student success as a basis for reflection upon the effects of particular factors or approaches. In one example, it is observed that the perceived and evaluated outcomes of study may differ, and qualitative methods are used to moderate the use of success indices (Trigwell & Prosser, 1991). In another, a more oblique approach to the measurement of efficiency is taken, principally relying on graduation rates, and concludes with an evaluation of educational quality measured by the number of scholarly works and published articles produced by both staff and students (Tuijnman, 1990).

In a recent study of undergraduate non-completion rates the dangers in any systematised approach to evaluation of success to establish links with prior factors are highlighted. The study refers to definitional problems with the use of completion as a basis for measurement of success and criticises comparative work on the basis that causal inferences were unfounded, being based too heavily on data aggregated to institution level (McPherson & Patterson, 1990). The researchers in this report are also at pains to point out that the effect of self-selection of study participants on educational research outcomes is frequently not adequately acknowledged.

Similarly, it has been observed that while it may be possible to measure the success (however defined) of any group of students undertaking undergraduate studies, and this is often done as a means of checking the effectiveness of selection processes, this provides at best only half the picture since it is not possible to measure the success of those who were not selected (Hohne, 1949).

Figure 1. An overview of some of the different approaches taken to the measurement of success.

Method	Description	Strengths/Weaknesses
Graduation Rates	Ratio of graduates to entrants within a defined period (adjusted for pipeline effects of changes in student population size).	Potentially the most valid objective measure of the achievement of goals; limited by the interference of irrelevant events.
Progress Rate	Rate of transition between course year levels adjusted against the proportion of full-time and part-time students.	Objective and easy to measure; favours quantity of passes but does not measure quality of learning.
Grade Point Averages	A weighted average of integer equivalents allotted in order of precedence to result grades.	Reflects both achievement and progress; heavily weights high achievement and can distort actual examination results.
Non-Attrition	Inverse of attrition rates on a course by course basis.	Easy to measure; assumes all attrition is failure.
Course Transfers	An index of the proportion of withdrawing students who are leaving to take up equivalent or higher level studies.	Recognises that withdrawal is not necessarily failure; turns attention to departing instead of continuing students.
Completion times	Total duration to completion divided by specified minimum completion time for course.	Gives a clear and simple throughput measure; potentially heavily influenced by incidental occurrences.
Self-Assessment	Achievement of self identified goals, acquisition of desired competencies.	Recognises that education is a personal experience; resource intensive, design of instruments is critical.
Curriculum choice analysis	Appraisal of success based on qualitative data on subject choice and reasons given.	Links student performance with teaching performance; is not referenced between subjects or courses.
Competency testing	Independent testing to ascertain competency levels attained by students at key points before/during/after their studies.	Provides an objective reference check outside of the teacher/student process; resource intensive, design of instruments is critical.

Brief descriptions of a number of the approaches taken to the definition and measurement of success, together with a summary of their respective strengths and weaknesses are presented at Figure 1 (above).

2.5 Behind the GPA Mystique

At this point it is helpful to acknowledge that assessment of undergraduate performance is a curious fusion of qualitative and quantitative processes. Assessments (with varying degrees of subjectivity) by the individual (examiner) are transformed, via an artificial process, into a standard measure (marks) which can then be added, weighted, multiplied, squeezed into bands or converted into grades. Grades in turn are available for use in a further series of computations such as calculation of a minimum grade average for admission to honours in some disciplines.

Several significant studies in recent times have used grade point averaging systems, as referred to by Stergar and Lapajne, as the principal measure of student success. This system of measurement, whilst arguably focussing somewhat on efficiency rather than depth of learning experience, does obviate problems identified in relation to the use of aggregated data on completion rates (McPherson and Patterson, 1990). An example of the use of grade point averages is the study by Camp (1990) wherein academic achievement defined in terms of grade averages is measured against data about extra curricular involvement of students. Other recent Australian studies

which have used GPAs as a dependant variable include West (1985) and Cobbin et al (1992).

Much of the recent literature about grade point averages has been critical of their use and of their validity. This rests principally, however, on two concerns: that GPAs impart the impression of a standard for comparison between fields of study or, worse, between students from different universities; and that GPAs encourage an unhealthy preoccupation with grades, inducing students to overlook much of value in the educational experience. Milton et al are among the most vigorous proponents of this viewpoint, however they concede that GPAs provide a valid basis for internal summative assessment of students within the university, and suggest that it is at the point when GPAs are made public, and become the basis for external assumptions, that their value is in question (Milton, Pollio & Eison, 1986).

A third focus of the discourse on GPAs is the variations between academic disciplines. Goldman and Hewitt (1975) highlight the idiosyncratic effect on GPAs of the multifarious mix of disciplines which are incorporated into the calculation, and commend the use of standardisation, not in individual subject grades, but in the computation of the overall average. This approach is taken to a logical conclusion by Wright and Masters (1982) with the creation of the *partial credit model* as a 'universal' scale of academic achievement. The partial credit model uses a complex application of the quantitative analysis methodology of regression to lend a semblance of objectivity to data which are, by their origins, both

qualitative and, to varying degrees, subjective. Standardisation may have some meaning in cases where there are common agreed outcomes, comparable assessment processes and a reference point of required competencies (Nguyen, 1986) and may be appropriate in external examinations within the secondary system where one seeks to measure in objective terms abstract quanta such as 'potential'. However, if two students obtain marks of 55% and grades of "Pass" in first year literature and first year physics respectively, it is difficult to find any justification for counting one more successful than the other or for differentiating their abilities since they have been measured against divergent criteria, with the marking (%) and grading (pass, credit, distinction etc) structures being the only common reference point.

In a recent predictive study (West, 1985) a balanced appraisal of GPAs as a measure of achievement concludes that inter-subject variations between marks are no longer significant at the level of grades (based on an observation that the majority of inter-discipline variations do not exceed mark bandwidths spanned by grades), and therefore rejects the earlier view that standardisation of GPAs should be considered. The analysis does, however, lead also to the conclusion that GPA formulae heavily weight good performance (since a high distinction can rate 2.5 times as much as a pass, though it required only 0.3 to 0.4 times as many marks to achieve). It is therefore reasonable to conclude that, even if grades were to be considered to be superior to the raw marks on which they are frequently based in terms of their usefulness for inter-disciplinary comparison, they are

less suitable as an index of academic success because of the uneven weightings which they produce.

Another approach which has recently resurfaced is the use of the weighted average mark (WAM), a single number derived by multiplying the marks for individual subjects by the weightings of the respective subjects (in student load or credit points) and then dividing their sum by the sum of the weightings, as a measure of academic performance (Lewis, 1994). This approach taps into raw data which are, arguably, richer in the subjective detail provided by examiners, and are closer to the source of subjective judgement. This addresses another of the concerns about GPAs: that they introduce a misleading impression of precision (being frequently expressed to two decimal places in a range from 0.00 to 5.00, five times the precision of marks from 1 to 100) into a process which has previously undergone generalisation in the conversion of marks to grades. This process introduces an arithmetic anomaly wherein, as a worst case, a difference of 1% in raw data (marks) can result in a difference of 20% in the 'finer' scale of the GPA. Although this margin of error is less likely to be significant when a large number of grades contribute to a GPA, it remains undesirable. Moreover in studies of student achievement where results from only one year are used (especially where these may include the results of part time students who have completed very few subjects), the margin of error of the GPA may be unacceptably high, and the weighted average mark is preferable.

Interestingly, the criticism of GPAs that they may introduce a misleading impression of precision has a familiar ring; it has also

been cited as part of the argument in favour of the use and publication of grades rather than marks. Before we stop smiling about this irony it is perhaps worth remembering that the processes by which marks are awarded in many disciplines are relatively mechanical. That is to say, the numerical assessment (or a significant part thereof) represents nothing more and nothing less than the number of questions to which a student provided an answer which corresponded to one or more of those deemed acceptable by the examiner; a relatively mechanical process in which the difference between seventy-nine and eighty is comparatively insignificant and does not warrant the bifurcation into Credit and Distinction (or C and B, H3 and H2 or whatever...) which is its consequence. It is acknowledged that there are disciplines in which marking and assessment processes are more highly subjective, and where marks may be allocated in part with a view to arriving at a grade outcome which is deemed appropriate (Heywood, 1989). Nevertheless, since marks are propagated from such a wide range of assessment processes with widely varying degrees of subjectivity, some of which suffer more than others from conversion to grades, it remains desirable for the purposes of research to use marks in place of grades wherever these are available.

2.6 Problems with the Student Progress Unit

An increasingly common alternative to the GPA as a measure of student achievement is the student progress unit (Linke et al, 1991; Dobson & Sharma, 1993) which is:

the sum of the load of enrolled subjects passed
÷
the sum of the load of all enrolled subjects

In terms of ease of access to the data from which the SPU is derived it is advantageous that the required data are readily available from the institutional statistical report files required annually by the Commonwealth. There are, however, two notable shortcomings with the SPU as a measure of student success. Many institutions permit students to withdraw from enrolment in a given subject for a defined period after the official enrolment census date, with the assurance that subjects so removed from a student's enrolment will not be regarded as having been 'failed'. The use of data from annual institutional statistical returns necessitates the inclusion of late withdrawals in enrolment load as has been required by the Commonwealth, and they are required to be reported as 'not passed' (Department of Employment, Education and Training, 1992). Therefore all late (ie. post census date) withdrawals are counted in the resulting SPU as academic failures whether or not they were so deemed by the institution. A further difficulty with the SPU measure is that, on its own, the SPU provides an incomplete picture insofar as it treats 51% the same as it treats 99%, and 49% the same as 2%. The SPU alone is only appropriate if passing is all that matters. In statistical terms the SPU is dichotomous, and therefore less sensitive to independent variable changes than a continuous dependent variable. This is a limitation that the SPU shares with the *pass rates* methodologies used by Keef (1992) and Magin (1993). A similar formula applied by Lewis (1994), which he termed the 'PPASS' also

shared the same limitations and, to overcome this, the Lewis study also made use of weighted average mark data.

As an adjunct or complement to another more sensitive measure such as a weighted average mark (where each subject mark is weighted according to the subject load or credit value) as in the case of the Lewis study, the SPU or a similar measure of course progress may be useful. In this sense, whereas the weighted average mark can be seen as a measure of the quality of the work completed by a student, the SPU presents a measure of the quantity of coursework passed by the student. A single measure combining the data which can be derived from both the weighted average mark and the student progress unit would, however, be preferable.

2.7 Other Possibilities

An alternative approach to the question of comparison of applicants who present with unlike qualifications or experience is substitution of more manageable criteria for the purposes of comparison. This commonly results in various propositions for the administration of context independent tests of which the Australian Scholastic Aptitude Test (ASAT) is perhaps the best known example. Whilst this approach appears to have much to recommend it in terms of the reduction of complex factors to quantifiable elements, it has been fraught with controversy. The controversy about selection testing stems in part from the lack of adequate empirical data to support the claims made by the proponents of particular tests and testing systems (Adams, 1984), and in part from the tendency for the content of such

tests to introduce biases which, although different from those which might exist in alternative methods (eg school aggregate scores), are no more justifiable.

It would be reasonable to conclude that objective testing remains an inadequate science because of the elusiveness of context independence, and because of the inaccessibility of hard evidence in support of the proposition that such tests provide a more adequate evaluative tool than others which they seek to replace.

A further feature of much of the related literature is its focus upon the more broadly defined issues of assessment as an integral part of the ongoing educational process. Parkyn (1967) advances the view that there are three avenues of exploration in relation to success predictors in higher education: those based on empirical data, with the number of units passed or the average of grades achieved providing key determinants of success; those based on school exit marks (aggregates) or class ranks, and finally, those based on a descriptive and necessarily generalised assessment of scholastic ability from the student's school. It is interesting to note (Northfield et al, 1992) that the VCE represents a consolidated approach to prediction in that it provides both a tertiary entry score in the form of the "Aggregate CAT Score" and a descriptive assessment (albeit codified) in the form of the "Tertiary Entry Profile" provided by each applicant's school.

Pidgeon and Yates (1968) propose an alternative analytical approach. This is one where the attributes desired of students in a course are

first identified and tabulated, and an assessment of the qualifications of each individual against the matrix of criteria is made, leading to a summative outcome. This approach shares some elements with the competency based training methodologies which increasingly dominate contemporary Australian discourse in relation to the planning of vocationally and skills training oriented programs. Despite the analytical approach, the method detailed by Pidgeon and Yates gives a stronger impression of objectivity than it can sustain under scrutiny. This is principally because each of the judgements which contribute to the matrix of requisite skills must be reached subjectively, and this foundation compromises the outcome.

In an examination of assessment methodologies, Heywood (1989) provides several useful pointers to the establishment of objectivity within assessment data which are useful in relation to this program. The first of these is the use of guidelines as the basis for a rating scale. This is proposed in relation to an unpublished scale for Masters' orals developed by Granville Johnson, and it is suggested that this be reapplied in various ways at undergraduate level. The value of this proposition is in its potential for use in relation to the classification of students into sample groups by attribute. In addition it is interesting to note that such a scale, if used in conjunction with the matrix proposed by Pidgeon and Yates, might provide a basis of objectivity which would more closely match their stated aim.

A further contribution from Heywood which has some significance for the program is his discourse on the subject of the relationship between goals and achievement, and the derivation of a definition of

success from this process. It is worth noting that without reference to the aims and expectations of the student or group of students in question, indices of success have little meaning.

Although the approaches taken to measurement vary enormously, even greater divergence of underpinning philosophies is evident among the competing methodological approaches to the question of student performance and academic outcomes. The challenge of this program however, is to find as its basis, an approach to measurement which will be sufficiently general in its applicability to provide for a range of comparisons and observations.

SECTION TWO: Research Design and Methods

Chapter 3:

Definitions of Success

In Chapter 2, the myriad options for defining and measuring student success were surveyed. This chapter draws upon the preceding overview of approaches to definition and measurement of success, to explicate an approach for the purposes of this research program. Before moving on to this task it is useful to revisit an earlier observation; it is within the context of the objectives of a particular study that each of the methodologies outlined in the preceding chapter has validity. For example, for studies which are concerned with efficiency with which resources are applied to the production of a qualified workforce, graduation rates (see Figure 1) may be a suitable measure of success. By contrast, a study of the causes of high failure rates might be better served by the application of a measure based on progress rates.

Notwithstanding that context dependence is reasonable, several researchers have sought to re-use or adapt measurement techniques used in other studies, and this is useful. It provides for more ready and meaningful comparison between the results of different studies, whilst enabling an independent test of the validity of the measurement methodology. It may also engender wider acceptance of the findings of such studies, given that their basis and methodology

may be acceptable to members or groups within their audience who would be sceptical about the value of findings, were they to be based on a conception of success which falls outside their own definition(s).

Examples of studies which have sought to reapply, or reinvent, measurement techniques used elsewhere may be seen in the recent studies by Long (1994) in his use of the partial credit model (Wright and Masters, 1982) and separately, Dobson and Sharma (1993, 1994) in their recent analyses based on the student progress unit (AVCC, 1985). These approaches, however, might be regarded as lying at opposite ends of a spectrum of possibilities, based on the review of related studies described in the preceding chapter.

3.1 Making Sense of the Methodological Minefield

One might characterise the extreme view at one end of the spectrum as saying that a student is successful if he/she makes her/himself happy. That is, if the student's own objectives have been met, if personal growth is perceived to have been accomplished, if the quality of life has improved (without even considering how that might be measured!) then the student has been successful. The studies by Hayden and Carpenter (1990), Stergar and Lapajne (1990) and Farmer et al (1991) provide interesting and thought provoking variations on this theme.

Some of the proponents of the view that self assessment provides the basis for the only or at least most reliable measure of students' success, hold strongly to the conviction that no measure of outcomes is valid without reference to the standpoint of the primary stake-

holders, in this case the students themselves. An equally strongly asserted view, however, is that students' perceptions of what factors contribute to their success and the perceptions of their examiners may have more differences than similarities (Killen, 1994). Both standpoints would appear to have some merit.

At the other end of the spectrum are those who would rely solely on marks, grades and pass rates, separately, or combined in some shape or form into a composite scale, as measures of success. One might contrast this with student-happiness theory by labelling it the teacher-happiness theory (if your lecturer is happy with you then you are a huge success). This approach, in a plethora of variations, has enjoyed considerable acceptance over several decades in Australia, and continues to provide the basis for work by contemporary Australian researchers such as Power et al (1987), Everett and Robins (1991), Magin (1993) and Lewis (1994). It is on this ground that the partial credit model and the student progress unit formulae referred to previously, stand.

Those who are not comfortable at either end of the spectrum frequently move beyond its limits, discarding the student-happiness and teacher-happiness approaches in favour of third-party-happiness. Some of these approaches are noteworthy for their appropriateness and innovation, including ability indexing (Entwistle and Wilson, 1977) and independent competency assessment (Beckwith, 1991). Still other approaches have been based upon data on the employment histories of recent graduates, and have drawn comparisons and conclusions from the information gleaned

from graduate surveys conducted annually throughout Australia by the Graduate Careers Council of Australia (Guthrie, 1990). It must be acknowledged that the scope within which such studies operate is such that, frequently, the measures of outcomes upon which they are based are, within context, entirely apt. For example, if one starts from the somewhat limited assumption that the object of higher education is principally to get young people into paid employment, then it is reasonable to pay heed to the preferences of employers first and foremost, as the measure of the success of the system and the individuals within it. More generally, one might suppose that where the context is specific and perhaps, narrowly defined, the criteria of a third party appear most likely to be of value.

In a broad context, where there is a need to generalise about the success of students, and to compare the achievement of students across diverse disciplines, fields and professions, measurement based on the application of the criteria of one or more third parties is unlikely to be appropriate. It is a matter for concern that the independent evaluation approach also accommodates the shifting sand where students can be counted as successful if the objectives of an Education Department have been met, if their employers have promoted them or if the researcher was impressed by them.

Fortunately, the three divergent approaches outlined above do not always tend in different directions. This is partly because they are linked and even interdependent in a variety of ways. For example a student can be assumed to have arrived at the point of undertaking a particular university course with a given set of expectations and

aspirations which, as the student's studies progress, give rise to a series of specific goals (Perry, 1968). The student will, in the course of time, be successful or otherwise in meeting such personal goals and in so doing will in many cases also satisfy the requirements of her/his teachers. In some cases this may be somewhat inadvertent, as in the process described by Bloom wherein a student whose only concern is to achieve a pass and thereby impress or appease parents and peers, may nevertheless legitimately acquire knowledge which the examiner values (Bloom, 1965).

Similarly, in satisfying her or his examiner, a student may acquire qualifications which in turn are valued by an employer or some other interested third party. In this way each of the three views of success can be seen to be interdependent and to feed each other in a process which might be viewed as a cycle of events. This is a process which could be mapped in a number of ways. The drawing which appears at Figure 2, however, illustrates one relatively simple view of it.

Figure 2. One way to consider the alternative frames of reference through which student success is viewed.

Clearly, each point on the continuous line which forms such a cycle is a more or less valid position from which to measure student

success for the purposes of the particular studies for which such measures have been developed. The concern of this study, however, is to arrive at a definition of success (and a methodology for its measurement) which can be used across a variety of studies which relate backgrounds, disciplines, aims and outcomes. The view has emerged that a hybrid methodology, one which takes account of more than one point of view, viz examiners' evaluations and students' self assessments and succeeds in moderating the differences which might exist between two or more of the inherently subjective standpoints referred to above, might have several advantages.

3.2 The Legitimacy (or Otherwise) of Marks and Grades

The first question to be answered is 'are examination results a useful measure of success'. There are two parts to this question: i) do students' results adequately or accurately reflect how well they have acquired knowledge and understanding or developed?; and ii) are all the benefits which might flow from an educational experience reflected in a student's marks?

The answer to the first part of the question lies in an appraisal of assessment practices in each subject, since it is self evident that students should be examined in such a way as to measure what they have accomplished, and particularly, to measure the extent to which they have achieved the aims of the curriculum. Whilst assessment practices may leave room for improvement (Heywood 1989), criticism, if it is to be constructive, is surely a basis for improvement rather than replacement. To put it another way, it has been illustrated that

the institutions and individuals who design both the curriculum and the corresponding assessment have, as a rule, a considerable investment in getting the components, and the match between them, right (Jones, 1988). Moreover, they are best placed to effect such a match and so, if in some cases there is a mismatch, it is nevertheless difficult to accept an argument for abandonment of the process. It therefore seems reasonable to contend that examination results, as the primary measure of student achievement, must be taken into account.

It has been well documented that a wide variety of factors can and do interfere with the effectiveness and accuracy of processes of assessment (Anderson & Priestly, 1960; Crooks, 1988). In recognition of this a variety of refinements and adjustments to assessment design in a number of disciplines have taken effect in recent times (Simms, 1992). Whilst recognising that a disturbingly high element of random occurrences may influence some marks and assessment procedures in some cases, one must also acknowledge that marks provide a measure of achievement generally accepted by students, teachers and others.

The second part of the question must be considered in recognition of various intangible benefits which may accrue to the individual during the educational experience, such as culturally enriching experiences and opportunities for personal growth and development beyond the strict limits of the curriculum. While these may not be directly measured by any success index which uses academic results as its sole basis, they are also less likely to be the principal concern of

studies of student success. Notwithstanding the objects of research, one might contend that, if benefits can be identified which are not accounted for in assessment processes, then this too is as compelling an argument for change or refinement in assessment processes as it is for their abandonment.

It is thus possible to conclude that, although not the only measure, the judgements of examiners are the single most important measure of students' success. Common sense suggests that students would not enrol in courses which they did not aim to pass (though it must be acknowledged that some students undertake studies chosen for them by others, and that the match between students' aptitudes or inclinations and the requirements of different subjects may vary). Moreover, a study of students' attitudes undertaken as part of this program (see Chapter 8) has shown that over 85% of surveyed students indicated that they were aiming for grades which were better than pass, or high grades, and the remainder were 'happy just to pass'. If it is accepted as reasonable to suppose that few, if any, students who enrol in undergraduate courses do so with the intention of failing, then it can be observed that students themselves, to varying extents, regard their academic results as a measure of their success.

To the extent that students achieve the grades they are aiming for, they may be counted as successful in their own terms (one measure of 'student-happiness'), whereas the extent to which students achieve high marks or grades per se, can be characterised as success in the terms of the examiners and the university (a measure of teacher-happiness). To the extent that courses are accredited and externally

recognised by employers and independent agencies, are endorsed by parents (who support their children's efforts) and employers (who employ graduates), the combination of student and teacher happiness measures may also be seen to provide an indirect measure of third-party happiness.

Some further attention must be given to the form in which examination results are presented. It is the policy of a number of Australian higher education institutions to publish examination results in the form of grades (or codes), representing generalised bands of achievement, without indicating the underlying marks on which these may have been based (Australian Vice-Chancellors' Committee, 1992). As was indicated in the preceding chapter, individual subjects in which a given student may have been enrolled, even within a single discipline, may vary considerably in the extent of subjectivity of the mark allocated by the examiner, depending primarily on the assessment design deemed appropriate for the curriculum. For this reason grades, as a more coarse-grained measure, represent a filter which does not reduce the sensitivity of the information in some cases, but may in others (Milton, Pollio, & Eison, 1986). Conversely, for the purposes of analysis, the substitution of marks for grades can be assumed to increase the sensitivity of measurement in the case of some, if not necessarily all, subjects.

A more ambitious contention in the debate about the relative merits of marks and grades for the purposes of researching success is that, even in those cases where assessment is entirely subjective (as opposed, for example, to tests designed such that there is a single,

clearly correct answer to each question), differences of even a few marks (eg five marks), which fall well within the same grade range, can be assumed to have been the consequence of a perceived qualitative difference between the works submitted for assessment in each case. If this view has any merit, then marks would have to be viewed as a more sensitive basis for computation of student success than grades in most, if not all, cases. It would appear that this view is one with which a number of contemporary researchers would agree, given the preponderance of recent studies (as cited previously) which include analysis of weighted average marks.

3.3 Scaling, Standardisation and Other Regressive Practices

There are a number of competing views about whether marks or scores representing students' achievements should be subjected to adjustments in one form or another and, if so, when and for what purpose. For example, recently developed regression based models for the scaling of year 12 results achieved by Victorian Certificate of Education students, for the purpose of calculation of a *tertiary entrance rank*, are sophisticated and have been widely accepted as defensible. This is, in part, because there is general acceptance that the various studies which comprise the VCE span a range of levels of difficulty, and there is no process by which assessment criteria are matched or linked between studies. As was indicated in the preceding chapter, this is not the case in relation to the range of subjects undertaken by higher education students.

The subjects offered within university curricula attract divergent populations of students with talents and aspirations towards varying levels and kinds of specialised knowledge. Moreover, some fields of study necessitate the application of conceptual skills of a particular type or order, which may be qualitatively different from the requirements of subjects at the same level (eg undergraduate first year) elsewhere in the university.

To address the question of standards, universities throughout Australia expose all new curricula to a process of accreditation wherein the proposed content and assessment for each individual subject is scrutinised to ascertain its conformity with the accepted broad criteria for study at the relevant level. This process can be seen as essentially one of criterion referencing along lines which parallel those proposed and accepted for new international curriculum reforms (Simpson & Frost, 1993). Although such processes may admit enormous variations between subjects, which may affect the extent of difficulty which students experience in completing them, they serve to establish a point of reference in relation to the conceptual and other skills which can be expected to have been acquired by students successfully completing the subject. In this respect they provide an external reference point for the outcomes of the work students undertake and, similarly, for the success that students can be deemed to have achieved in completing such studies. To then make adjustments to the results achieved by different cohorts of students in different subjects would be to retreat from the relatively objective standards established by the process of curriculum accreditation and would therefore be counterproductive. In other

words, given that accreditation offers a process which can be seen as a pro-active alternative to standardisation (whether or not one regards it as perfect), to then also scale results would be to reverse the process.

A further concern is that, since the assessment procedures are divergent in nature and the fields of study to which they apply are qualitatively different, the outcomes cannot be regarded as interchangeable in the form of cardinal numbers. To scale the marks allotted as the outcomes of fundamentally different processes is to seek to introduce a form of comparability which has no meaning in the context within which the marks have been determined. In one respect, this concern echoes that articulated previously, given that a point of reference already exists insofar as the results (as distinct from marks), which are the end-point of the assessment process in individual subjects, already possess commonly understood meanings across disciplines. The most stark illustration of this understanding can be observed in the understood difference between a pass and a fail result. To scale results is to introduce an arithmetic process in which a high fail in one subject may be adjusted to equate to a low pass in another subject. This is clearly nonsense, serving only to corrupt the purposes of the examination process. In terms of a measure of students' success, to the extent that there was any value or meaning in the assessment procedures in the first place, the application of either scaling or standardisation could risk its dilution or corruption.

Given that the above arguments are both abstract and theoretical, it may be helpful to consider a different approach to the question of the

comparability of the raw results of students in different studies. Over a number of years, the students attracted to a given field, for whatever reason may find it relatively easy to achieve the conceptual abilities and knowledge deemed by the university to be appropriate for the subject, given its level, and may therefore gain high mean marks. This may occur for any number of legitimate reasons (or, more probably, some combination of them): high quality teaching in the subject, high quality materials and other resources, readily available and highly suitable preparatory studies within the lower level curriculum or the ability of the university to attract highly capable students to the discipline. All of these reasons and perhaps others, are to be applauded and do not in any way detract from the central point: that students were very successful in the subject in question.

Were a process of scaling to be overlaid on the subject which provided the example in the preceding paragraph, the mean marks of students undertaking the subject in question would be brought more closely into line with the mean marks achieved in other subjects. Success - the very thing that one seeks to measure - would be obscured; something like the methodological equivalent of a double negative.

In summary, four principal issues have been identified in respect of the arithmetic adjustment of marks and grades, viz:

- curriculum moderation through accreditation already applies a common reference point. To then apply scaling or standardisation would be to introduce a second layer of adjustment at the risk of over-compensation or negation of the first;

- to scale or standardise results derived from diverse assessments in qualitatively different studies would be to seek to extend a form of comparability which does not first exist and which has no meaning in relation to the preceding assessment process;

- a form of referencing already exists in the common understanding of grades, and to seek to equate (for example) a fail in one subject with a pass in another would be to abandon the legitimate meaning of assessment outcomes;

- scaling, whilst purporting to treat irrelevant variations, risks instead obscuring those variations in performance which are deserving of scrutiny.

For these reasons, then, it has been determined that for the purposes of this program, comparisons of students' achievements should, to the extent that they rest upon marks, draw on the raw and unscaled data which form the basis of the graded results that students themselves receive.

A comparable set of questions arises when considering the approach to analysis of data. Where multiple variables may exist studies not infrequently apply statistical techniques involving one or more forms of regression analysis to the task of identifying dependent variables and defining causal attributes. In a thoroughgoing work dealing with problems which have emerged in the application of statistical procedures to longitudinal studies, increasing criticism of the regression approach is cited and it is suggested that causal structures have rarely been accurately determined by the application

of regression modelling (von Eye, 1990). Such views are echoed in the observations that application of regression analysis is declining (Cochran, 1983) and that descriptive and discourse based analyses are frequently better applied and understood within educational research (Jaeger, 1988).

A principal criticism of the application (or misapplication) of regression analysis relates to its use for the evaluation of causality when examining cross-lagged correlations (Rogosa, 1980). Rogosa suggests that the application of regression to large systems, particularly where they present large numbers of inter-dependent variables, is generally in violation of one or more of the assumptions underlying regression, particularly that of homogeneous stability within the data. Such a concern is directly applicable to the research undertaken within this program, given the complex presentation of inter-dependency among the variables (eg age, which is directly and/or indirectly linked to admission basis, work experience and financial support status) and given a high level of heterogeneity in the data.

In addition, the questionable reliability of regression when used for the identification or evaluation of the spuriousness of variables in large or complex systems has been demonstrated (Kenney, 1975). This would present a significant concern in relation to the analyses conducted within the program since a number of known correlates of success are present in the data (eg age, gender, entry score and motivation) and it is an underlying assumption of the program that other correlates may be present.

A third cause for concern in relation to the application of regression within the program arises from the issue of specification and measurement error, and the contribution they make to a lack of robustness in the use of a regression analysis as a basis for determining causal (or predictive) relationships (von Eye, 1990). This is an important consideration in relation to a process wherein measurement error cannot be accurately determined (eg in relation to subject marks or student statistics). Estimates of measurement error, confidence levels and degrees of freedom derived for use in the analysis of data such as those which provide the basis of this research must therefore, of necessity, be notional and arbitrary. The application of regression in such a circumstance would ensure that any results thus obtained were at least equally notional and arbitrary (Goldberger, 1971).

Notwithstanding the above, it is recognised that regression analysis has provided a valuable and accepted statistical model with proven application in certain areas of quantitative research. Whilst the legitimacy of various contemporary applications of regression analysis may continue to be a matter for debate, that is not what is in question here. The effect of application of regression analysis within hybrid methodologies wherein some or all of the data under review are subjective in nature and origin is the relevant issue, and the appropriateness of regression analysis for this program was therefore carefully considered.

Arising from this review of the suitability and applicability of regression analysis for the purposes of the program, it was concluded

that an alternative approach to the comparison of data appertaining to grouped variables should be applied. Consequently a simplification of the principles of regression has led to an investigative analysis approach where variables for a given sub-group (drawn from the sample on specific criteria), have been categorised as directly linked to the sampling criteria, indirectly linked to the sampling criteria or not linked. Group profiling has been used to identify the potential presence of spurious variables in each group prior to their categorisation. The possible effects of each variable have then been assessed with particular attention being given to known correlates of success.

Thus, as will be demonstrated in the application of the investigative analysis approach in subsequent chapters, groups of variables which are associated with known correlates of success can be identified and isolated, their contribution to the measured outcome being estimated on the basis of data produced in relation to the known correlates. In this way cognisance has been taken of causal links associated with spurious variables, especially those directly or indirectly associated with known correlates of success. This process has formed a central part of the analyses leading to the identification of causal links.

The approach to interpretation of data which has been adopted within this program is described in greater detail in Chapter 4 and its application is discussed in Chapter 11. Suffice to say at this point that multiple regression has as far as possible been avoided, as have other complex approaches to treatment of the data, in favour of a more pedestrian approach to the examination of cross-tabulation and

simple correlation, and a straightforward discussion of the analysis of the data. It is hoped that this approach will serve several purposes, including making the process of the study and its results more widely applicable and more readily accessible, as well as adhering to the simplest approach which is consistent with the objectives of the program.

3.4 The Proposed Model for Measurement

For the reasons outlined above, a success index has been developed for use in this program, based on weighted average marks rather than a GPA, with no further adjustment (beyond weighting, as described in the preceding chapter) by way of scaling, on the basis that studies accredited by the university at a given level (eg first-year undergraduate) and their respective assessment methods have already been deemed notionally equivalent (equal but different) through course accreditation and validation procedures, and the concepts of ability groupings or standard distributions have no relevance beyond this point.

In preference to the three methodological archetypes outlined above (student, teacher and third-party happiness), elements of the first two have therefore been combined by adjusting examination results according to students' stated aims. This means that the weighted average mark of a student who hoped to complete in minimum time but is not on track to do so (based on results to date) will be scaled proportionally downwards and will therefore count as less of a success. In this way a measure of progress, or the quantity of

achievement can be conjoined with the combined marks, which could be seen as representing the quality of achievement, to provide a single composite measure which combines the information of the types which can be drawn from both weighted average marks and student progress units.

To achieve the integration of progress data with aggregated marks, participants in the program have been divided into four groups on the basis of their intended completion time for the course, as expressed in their response to a related survey question. The groups were then separately matched against a notional minimum progress rate which would enable them to still meet their stated objective. For example, students hoping to complete in minimum time or less than minimum time were penalised if they did not successfully complete at least 90% of a standard load during their first year. The notional minimum progress rates (eg 90% for a student who aims to complete in minimum time) were determined on the basis that a student who does not complete given course components will be required to undertake (repeat) them in a subsequent year of the course. Repetition of a significant component of first year studies (eg more than 10%) during second year requires that a student who has already experienced some difficulties bears a further handicap, thereby increasing the prospect that the student will require additional time to complete the course and thus not fully meet her/his own stated completion time objective.

To apply the progress penalty, the Mean Average Mark for students was penalised in proportion to the extent by which their progress fell

short of the notional minimum. The formula was only applied to those students whose progress did not meet or exceed the notional minimum, and was as follows:

(The sum of the load of all subjects passed ÷ Notional minimum [0.9])

x

Weighted average mark

In some cases this produces a seeming double penalty. That is, students whose marks are low have consequently also fallen short of their progress aims and their low average mark is scaled still lower. This is, however, an accurate reflection of the outcome of their studies insofar as they have not only compromised their future in the course in question, but also the portable benefits of their results from a year's study for entry into employment or another course of study. From the student's viewpoint this is a double misfortune. Half of the misfortune is visible when one views a measure of quantity such as the student progress unit. The other half can be seen when one views a measure of quality such as the weighted average mark. The compound misfortune is represented by the success index.

A full transcript of the algorithm developed and used in the calculation of the index is reproduced for reference purposes in Appendix 5.

Similarly, the weighted average mark of a student who was aiming for bare passes and achieved that aim was scaled upwards to more closely equate to the success rating of a student who aimed for high grades and achieved them. This is on the basis that students' own goals are significant in determining what, for them, is a success. A

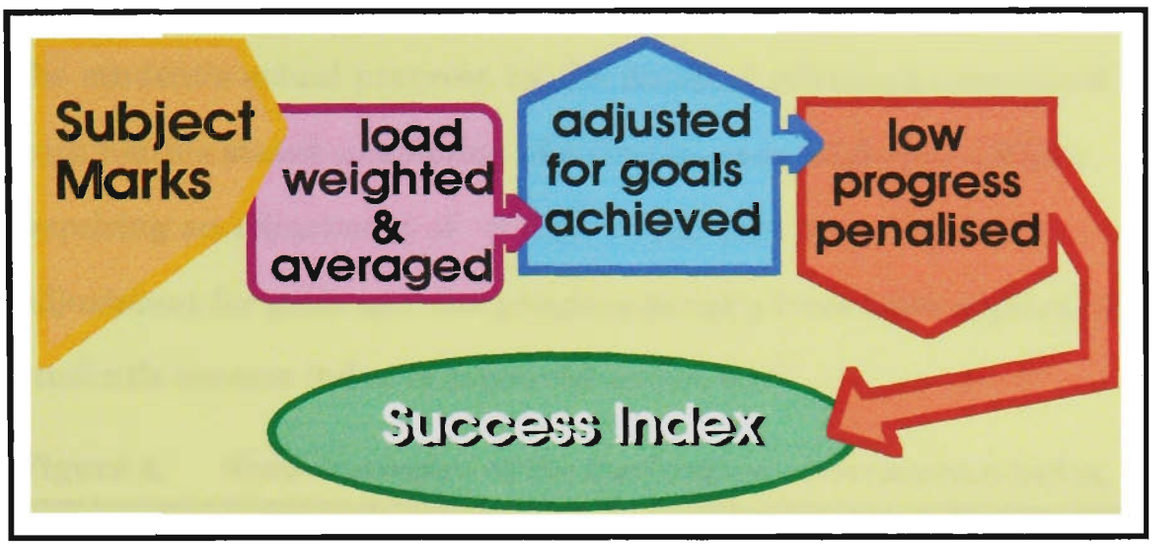
student who rarely achieves high marks and does not expect to achieve them, yet succeeds in doing so is a resounding success in her/his own terms. The adjustment against goals brings the achievements of students with very different aspirations more closely into line, and provides a compromise between the student's personal experience of achievement and the potentially more objective appraisal contained within the original weighted average mark.

The goal adjustment has been applied arithmetically (to achieve loadings of 11% and 25% respectively) to the weighted average marks of students who indicated in advance (ie before achieving any formal first year results) that they did not expect to achieve high grades. The scaling values have been chosen with reference to the difference between the mean marks associated with high grades (Distinction and High Distinction) and the mean marks associated with pass grades (25%) and the difference between the mean marks associated with moderate grades (Credit and Distinction) and that of pass grades (11%).

A visual representation of the various steps in the process of calculating the success index is provided at Figure 3 and examples of the way the calculations would be applied to several different students are provided at Figure 4.

The purpose of this cross-weighting approach is to produce a success index which takes some account of the reckoning of both the examiner and the student. To achieve this, data about students' grade and progression aims must be collected in advance.

Figure 3. Diagrammatic representation of the process for calculation of the success index.



The first example provided at Figure 4, called 'Student A' is that of a student whose self assessed motivation is in the middle band, and who has indicated he/she proposes to complete the course in minimum time. From the subject marks in the left column it can be seen that Student A passed four of the five subjects undertaken. In the second column it can be seen that the loads of the subjects undertaken, when added together equal 100% (ie a full year's study load). The subjects are not, however, all of equal weight. When each subject mark is multiplied by the relevant subject weight, weighted marks are produced, as shown in the third column and these, in turn, are added to produce the weighted average mark in the fourth column. The Goal Adjustment and Progress Penalty are then applied. In the first instance, since the student expressed medium motivation, a compensatory adjustment of 11% is applied to bring the student's performance against her/his aims into line with that of a high motivation student. Since the subject which Student A did not pass had a load of 12.5% and those which were passed had an aggregate load of 87.5%, Student A has fallen below the notional

minimum progress rate for a student intending to complete in minimum time (90%). The progress penalty is calculated by dividing the student's actual progress by the notional minimum associated with her/his stated completion aim (in this case, 87.5 ÷ 90 = 97.2%, requiring an adjustment of -2.8%). When both the upward adjustment for goals and the progress penalty have been applied, the student's success index is produced and is 69.7.

Figure 4. Some examples of the application of the success index.

Subject Marks	Subject Loads	Weighted Mark	Weighted Av'ge Mark	Goal Adjustment	Progress Penalty	Success Index
Student A; Medium motivation student aiming to complete in minimum time.						
55%	12.5%	6.875				
72%	20.0%	14.400				
68%	50.0%	34.000				
37%	12.5%	4.625				
93%	5.0%	4.650	64.55	+11%	-2.8%	**69.7**
Student B; High motivation student aiming to complete in minimum time.						
22%	25.0%	5.500				
55%	25.0%	13.750				
9%	25.0%	2.250				
88%	25.0%	22.000	43.5	Nil	-44.4%	**24.2**
Student C; Low motivation student aiming to complete in twice minimum time.						
76%	15.0%	25.300				
26%	10.0%	5.800				
63%	20.0%	28.000	59.1	+25%	Nil	**73.9**

NB: Weighted subject marks have been reported to three decimal places in line with load reporting requirements, and rounding applied after aggregation.

The procedure used at Figure 4 to calculate the success index for Student B begins in the same way as that for Student A, with the subject marks being multiplied by their respective subject loads to produce weighted marks which are in turn added to arrive at a weighted average mark. In this case, the student has indicated high motivation so no goal adjustment is necessary. Student B has,

however, passed only two of the four subjects attempted, which represent 50% of a year's workload (when their respective weights are added). Since student B also hoped to complete in minimum time but has fallen short of the notional minimum progress rate associated with that aim (90%) a progress penalty is applied. Again the progress penalty is calculated by dividing the student's actual progress rate by the notional minimum associated with her/his completion aims (50% ÷ 90% = 55.6%, leading to an adjustment of -44.4%). When this adjustment is applied a success index of 24.2 is achieved.

The third calculation at Figure 4 shows a part-time student, Student C, who passed two of the three subjects attempted, but whose total load represents only 45% of a normal full-time year's study. Again the subject marks are multiplied by subject weights, this time expressed as a proportion of the total load attempted, to arrive at weighted marks and these are summed to produce the weighted average mark of 59.1 at column 4. Since Student C indicated low motivation (was 'happy just to pass'), a goal adjustment of 25% is required to bring a performance in which the student's goals are achieved, into line with that of a high motivation student who achieved her/his own goals. Since Student C indicated that s/he expected to take twice minimum time to complete the course, no inferences can be drawn at this point about the rate of progress and, therefore, no progress penalty is required. When the goal adjustment is applied to the weighted average mark, a success index of 73.9 is the product.

As an alternative reference, in situations where comparisons between the results achieved in this program and those published in other studies may be desirable, or where analysis of one or more of the elements of data which contribute to the calculation of the index is undertaken, weighted average marks in conjunction with a *progress ratio* (calculated along similar lines to the student progress unit) have been provided. In addition, these provide a useful cross reference by which to assess the meaning of the success index, where all three are provided.

The progress ratio is produced for each student by dividing the aggregated weights of all subjects passed by the aggregated weights of all attempted, in a process comparable to the "pass rates" calculations used by Keef (1992) and Magin (1993). By way of illustration, the progress ratios for the 'hypothetical students' presented at Figure 4 would therefore be 87.5%, 50% and 77.8% respectively. For ease of comparison with weighted average marks, (and to distinguish it from the SPU) the progress ratio is presented as a percentage.

One important distinction has been drawn between the progress ratio and the student progress unit (SPU); timely withdrawals are not included among the data from which the progress ratio is calculated, whereas in some instances they will affect SPU. For example, where an 'academic withdrawal date' is specified (as was the case at Victoria University of Technology in 1993 and 1994), students may withdraw from enrolment after the higher education enrolment census date without incurring an academic failure (a "Withdrawn"

result code is recorded). Some students exercise this prerogative in a considered way. If these late withdrawals are counted as failures, as in the SPU, a distortion of measurement may occur which gives rise to a uniform reduction in the mean across a large sample (3 to 5% depending on enrolment patterns), but may have much greater impact on the mean of a smaller sample and can radically alter data on individual students.

Though the progress ratio is less rich in information than the success index, it provides a useful and simple measure of whether the student is passing, is less value-based than the index, and provides both a simple reference check as well as a point of comparison with other studies which use pass-rate or SPU based analysis. The progress rate is, therefore, primarily useful in conjunction with the unadjusted weighted average mark as a point of reference for comparison with other studies.

3.5 Longitudinal Frameworks and their Associated Pitfalls

A further question which studies of student performance must address is: how long should a student's studies be tracked in order to yield meaningful data about achievement? At face value, it is possible to assume that longer is better, but this is questionable.

Studies of completion rates serve to illustrate the problem which arises when the sample period for individual students is long. In Australian higher education it has long been known that we can expect that a large proportion of any cohort (up to around 60%) will not complete in minimum time, and up to 40% may not complete at

all (Murray, 1957; Martin, 1964). Little has changed. The reasons for delayed completion and non-completion are many and varied, however, and many are not remotely connected with the University or the ability of the student. Even where the cause is related to the student's studies, it is not safe to assume that failure to complete a course is failure per se; some students leave to take up a more challenging course, or to pursue some other avenue opened up because of their academic achievements up to that point. These cases can hardly be accounted as failures.

In fact efforts to document the reasons for non-completion have shown that they form a part of the narrative of individual students' life histories, leading one Australian researcher to remark that trying to account for academic performance is like "trying to nail red-currant jelly to a wall" (Anderson, 1970).

The longer the time-frame within which one observes the fate of university students, the greater the likelihood that incidental factors will intercede. Given sufficient time, the influence of remote events will become more significant than the effects of those factors which are the subject of the study. For example, one can expect to start out studying the effects of language background on students' success, but five years later one will, in fact, be studying the effects of everything from walking under a bus to falling in love. If there were any students who failed to complete because of factors related to their language background, they will be lost among the students who were overtaken by incidental circumstances. Similarly, if the time-frame is shorter than one year, incidental events may occur which produce

aberrations in results, however such events can be expected to have less impact on results from a full year.

For this reason, a measure of progress towards a defined goal (such as the progress ratio) which draws on data across one full *academic year* (a shorter period during which relatively few students drop out, change course etc, compared to the aggregate attrition over the three or more years' duration for completion of a typical undergraduate degree) provides a collection of data in which incidental factors have proportionally less influence, and the effect of specific factors can be identified. For this purpose, an academic year is defined as "the calendar year which falls between the first day of teaching in semester one and the last working day before the first day of teaching in semester one in the year which follows". This time span allows for resubmission of work and catch up of failures over summer and thus represents a period which is a whole in itself.

The suggestion that student achievement be measured over a defined and manageable period of one academic year is not to turn the focus away from graduation as the ultimate goal of enrolment, but to recognise that interceding factors impede the measurement of graduation rates per se. The measurement of progress towards graduation and quality of achievement within a shorter reference period provides a viable alternative, one which facilitates the progressive evaluation of education policy and practice.

Having concluded that results from a single academic year should be used as the data from which an index of success should be derived,

the question remains as to which year of study should be chosen. Studies which have compared entry scores with later year performance have not produced a consistent pattern (Firth, 1972; Lewis, 1994). Where a stronger correlation exists with second year results, however, this can largely be explained by the departure after first year of some of the students whose university results did not meet expectations. Since it seems there is little to choose between year levels, it is appropriate to choose first year (level one) academic results for several reasons. First year results can be obtained without a delay of several years, so studies can be carried out within reasonably short time frames. A majority of studies have used first year results, and their continued use makes comparison of the results of different studies more meaningful. The shorter time-frame for collection of data which is possible when first year results are used provides for feedback of the conclusions of a study in time to influence developing institutional policies and to inform the debates about educational issues.

With these considerations in mind, it has been decided to limit the application of the success index and other forms of analysis to the first year enrolment and academic results data on each of the participating students.

3.6 Key Observations about the Success Index

In short, the conclusions and observations arising from the deliberations reported in this chapter have direct bearing on the methodology of the research program described in this thesis. Several

of the key points which may usefully be borne in mind whilst reading the following chapter are summarised below:

- Comparisons of students' achievements should, to the extent that they rest upon marks, draw on the raw and unscaled data which form the basis of graded results;

- Complex approaches to treatment of the data, including multiple regression, have been largely passed over in favour of the examination of cross-tabulation and simple correlation. This accords with the aim of adhering to the simplest approach which is consistent with the objects of the program;

- An integrated approach to the measurement of success is preferred, drawing upon assessments of examiners and students in the form of weighted average marks and survey responses respectively, and a single index has been devised accordingly;

- As a secondary check, where appropriate either a progress ratio or a weighted average mark will also be used to aid interpretation and to facilitate comparison with the results of other studies;

- Examination of students' performance will be based on the results of their first year of study.

Chapter 4:

Methodological Considerations

During the course of discussion of related studies and competing viewpoints in the previous chapter, some aspects of the methodologies selected for use in this program have been outlined or the ideas underpinning them indicated. These have been principally those methodological considerations pertinent to the measurement of students' success in their higher education studies.

Rather than repeat here elements of the explanations and rationales for the above when explaining the application and meaning of the success index in this chapter, the reader is referred to Chapter 3, and particularly to the key points which appear in the closing paragraphs. In the discussion that follows, the five key points listed in Chapter 3 will therefore be taken as understood.

4.1 Qualitative vs Quantitative Methods

The field of research has frequently been regarded as being loosely divided into different camps on the basis of the approach taken to gathering and interpretation of information. It continues to be widely understood that those studies which have sought to apply a numerical framework to the analysis of data can be characterised as quantitative research as opposed to those studies which have used discourse, applied logic and other insights to arrive at an understanding and which have been termed qualitative research. Whilst there are many other ways to view and describe the processes

of research and there are many alternative approaches within each of the aforementioned groupings, the distinction between qualitative and quantitative research has been a useful one (Walford, 1991).

The trend in recent times towards studies which cannot be readily categorised in terms of the qualitative/quantitative division was a recognised (Jaeger, 1988), though relatively recent, development at the time that this study was first conceived. Such studies are frequently termed "hybrid" to indicate that they fuse together processes for research which were formerly associated with one or other approach. In practice, this has frequently involved either the gathering of data using characteristically qualitative or discourse based methods and its interpretation using statistical tools, or conversely, the analysis of information which has been acquired through more traditional measurement artefacts, by the application of logic and understanding outside of the quantitative framework.

As has been observed by others, some benefits accrue from the application of a mixture of research methodologies (McGaw et al, 1991) in that the extent to which the nature of both the questions addressed and answers provided are dictated by the approach can be moderated. Lee Shulman (1988, p23) expressed the view that "Ways of seeing are ways of knowing and of not knowing; and knowing well is knowing in more than a single way". In support of this postulation, Shulman provides ample illustrations of the shortcomings of the application of a single approach to disciplined inquiry.

Within the arena of educational research qualitative frameworks for research have enjoyed prevalence in recent times. Moreover, there is acceptance of the view that methods are best chosen according to the nature of the data and the objects of the study in question (Shulman, 1988). Increasingly, the practice of fusing processes which once were considered disparate and even antithetical is accepted as appropriate and even desirable.

The field of education is one in which qualitative judgements abound. Teachers and students make them routinely, as indeed many of us must in the course of our daily lives. Within higher education however, assessments and examinations invariably depend to a greater or lesser extent upon the qualitative judgements of one or more examiners. The acceptance of qualitative frameworks does not merely flow from this fact as a result of some form of weakening of resistance, it is more or less dictated by it insofar as it requires judgement to interpret and understand judgements.

It is important to note that the appropriate application of statistical tools also requires judgement of a high order. For example, in producing meaningful data from a straightforward comparison of values yielded by two disparate groups, an estimate of significance is frequently derived mathematically from the data, with the object of reaching a conclusion about whether differences between the groups are meaningful. This, however, is by no means a mechanical process, with the analyst being required to choose from several methods for the calculation or estimation of significance and then of necessity choosing, in many cases somewhat arbitrarily, confidence

levels upon which to apply the formulae. A different decision at any point may yield an opposite outcome (Taylor, 1990). The tools and the process are simple enough, but the judgements concerning their use are not.

In a previous reference to the application of multiple regression in correlational studies (see Chapter 3) it was indicated that such techniques have been frequently misapplied and rarely produce the results which are sought from them. A recent work on the subject makes reference to the conclusions of several researchers including Rogosa (1980) and Duncan (1969) that no methodological procedure will substitute for the fundamental necessity of integrating theory and research design (Burr, 1990).

It must be recognised that the substance upon which this program of research is based – the data – is almost exclusively subjective in its origins. The data are diverse and include enrolment statistics and personal data, examination results and survey data from a variety of questions designed to measure attitudes and values. A few elements of the data in question are not the product of complex judgements on the part of one or more individuals – students' date of birth and year of enrolment being examples. Many more components of the data are, however, subjectively based, and these include answers to enrolment statistics questions about students' anticipated main source of financial support, about the main language spoken at home, whether or not childcare requirements will present difficulties during the course, attitudinal responses on students' survey returns

and, of course, the marks allocated by examiners based on a myriad of more or less subjective judgements.

Frequently, studies within sociology and education present information in a way which purports to be methodical and even scientific. All too often, however, this warrants closer examination. The treatment of data using precise and sophisticated statistical tools at times belies the subjective and sometimes arbitrary nature of the source data, giving an altogether unreal impression of robustness and accuracy. It is useful to keep in mind that the mechanism which produces a given conclusion can hardly be more sound than the most subjective element upon which it is based – a reapplication of the familiar 'weakest link in the chain' maxim.

With these various considerations in mind, the method(s) for this program have been chosen, making it one which could be characterised as hybrid, insofar as it draws upon aspects which one might associate with either qualitative or quantitative studies. Specifically, the sources of data present a heterogenous mix of fact and artefact wherein within a single element of data competing values, interpretations and assumptions may lie. On the whole, then, it is safest to assume that the sources of information for the program are principally subjective, despite the veneer of objectivity loaned them by the various and multifarious forms of codification to which they have been subjected and despite also the elaborate structures within which the data are presented and the 'official' status of information collected for various statutory purposes. In the face of a mass of data from such origins, any attempt to arrive at a

meaningful measure of error or confidence level would be arbitrary at best. It must be conceded that one might draw as readily upon such information in a discursive style as in the de-personalised form of a database.

Without losing sight of the nature of the data and their inherently subjective origins, codified information has been processed using database software and data analysis tools in what can best be termed a quasi-quantitative process. The most elaborate construct within the mathematical processes to which the data have been subjected is the success index, which draws upon data from all sources to effect an integral measure. In so doing, the program seeks to render an array of potentially confusing and conflicting information in a simple form in which exploration and interrogation of the data become possible.

Having moved from the discursive realm of human behaviour and subjective judgement into the clinical precision of statistics, one might be tempted to remain there as so many studies have done. Indeed it is the object of this program to produce materials which can be viewed graphically in the form of charts and *box plots*, as one of several means to understand and interrogate the array of data. However it is intended that this should occur within the context of a reflective process and a discourse which retains as its base an awareness of the sources and underlying meaning of the various component parts of the data. To put it more plainly, no amount of sophisticated treatment of data or scientific method can alter the fact that a myriad of human judgements attend every stage of the process of this investigation, and no attempt will be made to represent the

study as one in which meaningful conclusions can be reached by way of statistical machinations.

A further issue is that, given that the end point of the program is information and insight, it is desirable that its products be shared and understood by those whom they may concern. The more elaborate the construct and the more obscure the artefacts upon which an argument is based, the more impenetrable the findings are apt to be. On the contrary, it should be possible to give form to a process and an outcome which is sufficiently transparent that it can be widely understood.

4.2 Practical Considerations

Within Australia, public funded universities are under obligation to provide enrolment data files to the Department of Employment Education Training and Youth Affairs in an annual cycle. The data required by the Commonwealth include an array of statistical information on each enrolled student, much of which relates only indirectly to enrolment, but which provides the basis for some insight into the student's background and life circumstances. Although a great deal of data are collected and stored, it would appear that relatively little of them are used, and the overviews which are published periodically do not contain thoroughgoing analysis of the kind which would be possible with such a vast data bank (Maslen & Slattery, 1994).

In order to comply with statistical reporting requirements, most institutions of higher education within Australia maintain a current

set of statistical data on all their students. Access to statistical data is therefore something which might be negotiated with one or more individual institutions. In this instance, the then University Secretary and Registrar of Victoria University of Technology agreed to the use of University data for the purposes of the program, subject to confidentiality constraints and Ethics Committee clearance.

Victoria University of Technology, having emerged from the Dawkins reforms with the abolition of the binary system, comprises six campuses distributed throughout the western metropolitan region of Melbourne, and the surrounding districts (as well as several offshore teaching sites). Its student population is one of the most diverse in the nation (Ashenden & Milligan, 1994), and its courses span all fields of study (and include most disciplines). As such it provides an ideal base for an investigation of the fates of students whose backgrounds or circumstances differ.

Although a great deal of information was made available to the program from the University's enrolment records, the data routinely collected from students at the time of enrolment were not sufficient to serve the objects of the proposed investigation. Therefore it was necessary to approach individual students directly to obtain additional information. This was done in such a way as to provide students with the option of furnishing the requested information and becoming a participant in the study or not as a matter of personal choice. A direct consequence of this was that not all students agreed to participate, and therefore it was a matter of concern as to whether the survey respondents were a representative sample of their

respective cohorts. A procedure was developed to examine this issue entailing the profiling of the survey respondents against an array of background data in enrolment files, and comparing the profiles thus obtained to those drawn from data made available by the University in relation to the total group of students who were invited to participate in the program. Both the procedure and the results of the process are discussed in greater detail in Chapter 5.

Initially, extracts from the University's enrolment files for the 1993 academic year were used as the basis for a letter to targetted students inviting them to participate, and surveys returned from these students were matched with the extracted enrolment data. Academic results for the first semester of study for these students were subsequently made available and the first trials were then commenced. The trials were conducted for the purposes of refining the model for calculation of the success index and as a guide to preparation of the software which was to accommodate the storage, data handling and analysis requirements of the program. The collection of academic results was then repeated after the results from the 1993 academic year were finalised in April 1994, and the whole exercise was repeated in 1994/5, culminating in the collection of complete data sets comprising extracts of enrolment data, statistical data, survey returns and academic results files on two cohorts of students.

The students who were to form the *target group* for the program were selected according to the following criteria:

- that they were onshore undergraduate higher education students;
- that they were new to the University;
- that they were enrolled at level one (as defined by DEET – more commonly and colloquially referred to as first year).

The reasons for specifying the criteria indicated above were several. In the first instance, onshore undergraduate higher education students represent the largest single group within the University and are undertaking a vast array of courses, each of which is referenced to the same level through the University's internal processes of accreditation. The availability of groups of several thousand students within each year undertaking notionally equivalent courses provided a uniquely appropriate basis for an investigation of this type.

The second and third criteria were chosen because this is the group which presents greatest difficulty at the point of selection, it being relatively difficult for the University to make judgements as to which students are most likely to succeed, especially where students' backgrounds are such that they do not have comparable prior studies (eg VCE). It is this group therefore, about whom additional information would aid admission deliberations, and their selection for this investigation increases the likelihood that its findings will prove to be useful and applicable at some point in the future.

In 1993 there were 2,469 students enrolled at the University who met all three of the criteria indicated above. In 1994 the number was 2,933, making a total of 5,402 in the target group. Across both years combined, 2,313 responses were received to the initial invitation, and

in each year, a follow-up request was sent. In all, 8,491 personalised letters of invitation accompanied by survey questionnaires and reply paid envelopes were prepared and mailed to target students. The University's Mail Room assisted in the receipt and direction of responses from students, which were then held for collection in the offices of the Department of Education at the Footscray Campus.

One of the matters of practical concern throughout the program has been completeness and accuracy of data. Various events within the University including the installation of new mainframe databases and related software and the implementation of changes in statistical collection procedures and data structures resulted in anomalies and omissions of various sorts in the data made available for the program. Consequently a variety of integrity checks and completeness checks were conducted by the program, and the assistance of staff of the Information Technology and Student Administration Departments of the University was required in order to correct various errors and omissions.

The process of collection of the data required for the program in respect of the two targetted cohorts was nominally complete by May 1995, and the process of calculation of secondary information and, ultimately, the success index commenced. During the latter part of that year, however, various minor data anomalies were identified and corrected, and the formulae for the success index was further refined. Consequently, the final aggregation and analysis of the data presented in this thesis could not be commenced in earnest until early 1996.

4.3 Design of the Questionnaire

The approach to questionnaire design was of pivotal importance to the success of the program. The appropriateness and accuracy of responses was one concern. The maximisation of the participation rate was of equal concern. The process of drafting was therefore a long and careful one, and the conception of the survey evolved substantially during that phase.

Initially, questions were compiled which were to supplement those which students had completed at enrolment, directed at ascertaining the history of the student in relation to education and employment, and her/his cultural and socio-economic status. A number of additional questions were added based on attitudinal measurement guidelines (Henerson et al, 1987) which were directed at ascertaining the students' attitudes to study, reasons for choosing subjects and goals and ambitions. A list of in excess of twenty questions was initially compiled and refined.

In preparing questions for inclusion in the survey, heed was given to the fact that the number of questions, and even the number of pages they spanned would be likely to be of significance in relation to the number of students who chose to respond. Considerable attention was paid to the format and purpose of questions with a view to collapsing questions together and stripping back to bare essentials. As a result of this process, a draft questionnaire containing only ten questions emerged, and after further refinement, the number was reduced to six. The 'modern wonder' of desktop publishing was harnessed to

squeeze all six questions onto one side of a single A4 sized sheet of paper.

To further reduce the extent of work perceived by students to be required of them (to minimise one of the potential disincentives to otherwise willing participants) the questions were restructured to require only the ticking of one pre-printed box for each question. The resulting questionnaire was literally one that could be completed in only a couple of minutes. Moreover the simplification of the design of the questionnaire also rendered simple the codification and recording of responses into a database of survey returns.

Having arrived at a model for the questionnaire, a pilot survey was conducted using two separate groups, each of approximately twenty students, with a view to determining the effectiveness of the layout of the questionnaire and the appropriateness of the language used. The students selected for these two exercises were co-opted from classes of first year students in mid April and early May 1993 respectively, with the benevolent cooperation of their teachers. The classes were those which were frequently undertaken as elective studies in order to ensure that the selected groups were of mixed gender, mixed background and came from a range of disciplines. The cooperation and patience of these students was exemplary, and their enthusiasm for the program was uplifting.

Each of the pilot groups of students was first given only scant information (so as to place them in a similar position to students who would receive the questionnaire in its final form), and asked to

answer each of the questions without talking or otherwise communicating with one another. The answers to the draft survey forms were then collected and the groups of students were subsequently provided with some additional detail about the broad thrust of the program and the reasons for requesting their assistance. The pilot participants were then interviewed in small groups to ascertain their overall response to the survey as well as their interpretations of the questions and to invite their suggestions and comments about the survey and the process of invitation which was in planning at that time.

As a result of the contributions of pilot participants, and of observations arising from their feedback about the answers they had given to each of the questions, several further minor amendments were made to the format of the survey, including amendments to wording and the reordering of several questions.

In 1994 the same format was followed for the survey, with one exception. The format from the previous year was retained first because it had proven successful in terms of the response rate and also the apparent quality of the information provided by participating students and second, to ensure maximum consistency between the data available from the two cohorts, with a view to its being used for comparisons between the two groups. The one exception was that a question concerning anticipated difficulties and disadvantage which was included on the enrolment forms completed by students at the University in 1993 was omitted by the University in 1994. This was unfortunate as the information was likely to prove useful in the

analysis of data as well as the profiling of respondents. In order to maintain as close an equivalency as possible of the data available to the program for both cohorts, a question along the lines of the one which had been dropped from the University's enrolment forms was included as the seventh and final question on the questionnaire forwarded to target students in 1994. Reproductions of the layout of the questionnaires used in both 1993 and 1994 may be found at Appendix 2.

A further issue which was considered to be of significance in relation to the collection of survey data was the timing of the mailout of the invitations to participate. There were two dimensions to this concern; that the surveys should reach students relatively early in their studies and that the timing of the surveys should be the same in 1994 as it was in 1993. Since the survey included questions about the students' ambitions in respect of grades and intended duration until course completion, it was considered ideal that students return the survey early in their studies so as not to be overly influenced in their reported aspirations by indications of their early results in their course. The reason that it was considered to be important that the timing of surveys in 1993 and 1994 was comparable was to ensure that the conditions under which the data were collected were as close as possible in both years, again, to maximise the comparability of data and allow for valid comparisons between the response patterns in the data furnished by the two cohorts.

In the event, the process of design and trialing of the survey, and also correction of anomalies in the data arising from the implementation

of a new university student database for the 1993 academic year prevented the mailing of the first invitation to participate until the latter part of first semester. In the interests of preserving comparability, the mailing in 1994 was delayed until the same point even though such considerations did not apply again in that year. The completed survey returns continued to arrive throughout the examination period and semester break, and a follow-up mailout to those students who had not yet responded was then sent early in the second semester of each year. Since the second mailouts were to take place after students had received semester one results, they were colour coded to distinguish them from those of the first mailout, and the returns from the first and second mailouts in each year were kept separate in order to allow investigation of any differences in the response patterns between the early and late returns, particularly in the answers to those questions relating to students' motivation and aspirations.

4.4 Ethical Considerations

A number of ethical issues were attendant upon the various decisions which have been described in the foregoing account of the research design. One of those related to the question of inducement of students to participate in the program. Although the pilot survey participants made a variety of suggestions concerning ways one might seek to encourage students to take part in the program, several of these involved making social or material provision for students. Despite the attractiveness of some of the ideas put forward, it was considered to be of importance that students were not placed in a position of

compromise where uncertainties or concerns they may have about issues of privacy or other matters might be set aside in the face of such inducements, to their subsequent detriment. Therefore the approach to students as contained in the covering letter over the name of the then Director of Research within the Department of Education at the University was limited to an appeal to altruistic sentiment in its exhortations to students to furnish the requested data.

Of equal concern from an ethical standpoint was that students should be apprised of salient facts about the extent of the commitment required of them and the safeguards and potential intrusions on their privacy when making their decision to participate or not. These issues were therefore worded carefully and included in the covering letter, and the draft letter and draft survey were placed before the Human Research Ethics Committee of the University which duly indicated its approval. A copy of the draft letter is reproduced for reference purposes at Appendix 3.

As part of the overall research design, in addition to the attention paid to the format of the survey and covering letter, ethical considerations were brought to bear on the questions of intrusiveness, confidentiality and promulgation of data.

In the first instance, the structure of the methodology was conceived and adapted with a view to minimising both the intrusion upon students and the extent of work required from them. As well as ensuring that, from an ethical standpoint, the study was not

unnecessarily high in its impact, this probably served to reduce or eliminate one of the disincentives to participation.

Concerns about confidentiality have been met by the application of a variety of measures. In the first instance, the survey format was designed so that randomly allocated numbers were the only markers of the students' identities so that, in the event that responses went astray or were seen by persons outside the program, the confidentiality of the information they contained would not be compromised. Data returned by students were not physically matched with other records relating to their enrolment, but were instead recorded in a computer database which was protected by password security and encryption to prevent unauthorised access. Data made available for publication and presented in seminars, conferences and other forums have included no references to individuals, nor any information which might lead to individuals being recognised or identified.

A further matter for consideration in relation to the responsible use of information has been the potential for incomplete constructions of analysis to engender misconceptions about the probable meaning of the data, or to mislead outright. The potential for early conclusions which might appear to support one or more popular and politically contended viewpoints to become hearsay or assumed fact has been noted and avoided.

4.5 Approach to Potential Respondents

As indicated above, potential participants in this program were first identified according to criteria which were directed at isolating the

students whose participation in the program would most enhance its prospects of providing meaningful and relevant insights. Enrolment records and addresses of students who met the indicated criteria were then extracted from the University's mainframe database and used for the preparation of personalised letters to individual students, in line with the wording endorsed by the Human Research Ethics Committee.

The initial and follow-up mailouts to the target group of students in 1993 took place on 2nd July 1993 and 9th September 1993 respectively. Similarly, mailouts to the target group in 1994 were made on the 2nd July 1994 and 9th September 1994.

Of the 5,402 students who were invited to participate in the program, 610 students withdrew from enrolment during the period over which the survey returns from the first and second mailouts in their respective years were received. From the remaining 4,792 students, a total of 3,117 responses were received, being comprised of 2,313 responses to the initial mailouts and a further 804 responses to the follow-up letters.

4.6 Management of the Data

The volume of data which had been acquired by June 1995 was large and required careful handling and storage. Personal computer based files were devised for the purpose of storing and interlinking information gleaned from various sources. The information used in the program was loosely (in the sense that the classification of some elements of data was context dependent) divided into two categories:

- primary information, which comprised all the information obtained directly and indirectly from participants, such as enrolment details, survey responses and academic results, and
- secondary information which comprised course and subject weightings, regional analyses of postcodes, reference tables on the coding of various forms of enrolment statistics, result code keys for the gradings and marking structures in use and other ancillary reference materials.

The repositories for data have been developed in the FileMaker Pro environment in Macintosh and Windows based personal computers, and make extensive use of quasi-relational, calculation and summary reporting capabilities of this environment.

The primary data were loaded into specially programmed database applications, one for management of academic progress data and the other for a combination of enrolment statistics, personal details (age, gender etc) and survey responses. These applications comprise 346 fields of data within each of 3,117 records on individual participating students, making a total of over one million elements of data available within the special purpose software written as part of the program.

The files of secondary and ancillary data were also specially coded and built for the purpose of cross referencing data within the main applications and, in total, are of comparable size and complexity to the primary data repositories. The primary and secondary files were interlinked so as to automate cross referencing and the calculation of basic statistics.

Data provided by the University administration were imported directly into personal computer based files within the applications developed for the program, or cross linked with the main applications via the use of ancillary files.

Data obtained from survey returns were manually entered into the database application devised for handling individual statistical and survey data, and each response was double checked for accuracy on a subsequent occasion.

Access to the data contained within the primary applications was restricted to those directly involved with the program by the use of security passwords and encryption.

Detailed descriptions and technical specifications for the software described above are included at Appendix 4.

4.7 Towards Application of the Adopted Methods

Having established within this section the basis of the collection, handling, storage and treatment of data for the program, the necessary preparations for analysis of the data have been completed. The next stage of the program, therefore, entailed preliminary examinations of the data yielded by the survey returns in 1993 and 1994 with, in the first instance, the object of ascertaining the extent to which the sample was representative of the target population.

Following on from the initial survey of the data collected for the program, a number of preliminary explorations of the data were

undertaken with a view to ascertaining the scope and nature of the group under scrutiny, including examining aspects of the sample in light of findings reported by others concerning contemporary trends and correlates of success. These stages of the program also furnished the opportunities for trialing the evaluation methodologies discussed in this section. An account is given in the following section of the first steps towards a thorough investigation of key aspects of the data, beginning with an examination of the survey returns, response rates and representativeness of the sample in Chapter 5.

SECTION THREE: Overview of the Respondents

Chapter 5:
The Participants and Their Backgrounds

Who are the students who now undertake higher education courses and where did they come from? What is the relationship between their previous experience, their aspirations and their subsequent performance as a student? These general questions lie behind the specific thrust of the program of research described in this thesis. As part of the wider program, it is necessary at this point to examine the composition of the group of students who provided the data for the study. As was indicated in the previous chapter, the participants in the program were drawn from among two cohorts of new, undergraduate, higher education, level one students studying at onshore teaching sites of Victoria University of Technology.

This chapter presents, in the first instance, a review of the mix of characteristics of all students admitted to the first level of undergraduate higher education courses at Victoria University of Technology in the years in question (1993 and 1994). The question as to "what is an acceptable or appropriate background for admission to an undergraduate course?" will come later; at this point the composition of the target group – the group of students who were invited to become participants in the program – is all that is in question.

It has been observed that demographic and ethnographic approaches to educational research have gained increased acceptance in recent decades (Wolcott, 1988), and it might, therefore, be accepted by some that an adequate account of the state of tertiary education could be reached by an analysis of data about its participants. The extent of data collection specifications and requirements of tertiary education funding bodies at the Federal and State levels in Australia suggests that an evaluation based on such an approach has gained a foothold in the arena of government policy. An alternative view would appear to have greater merit: that the aggregation of data on the participants in higher education is valuable primarily as the basis for informed investigation and research – such as the evaluation programs which have emerged in recent years and, for that matter, such as that undertaken within this program – rather than as an end in itself.

A review of the backgrounds of tertiary entrants at a recently established institution which has adopted relatively progressive admission policies is interesting enough in itself in that it provides a form of profile of the student population, as well as some indication of the aspirations of a generation of youth. It is recognised that this may be of value irrespective of the wider aims of the program. The approach taken to the review described herein is, however, dictated by the requirements of the program insofar as it has sought to identify the extent to which backgrounds are legitimate indicators of potential for success in tertiary study, and to provide a systematic basis for appraising the relative success of sample groups drawn from a cohort of entrants.

There is a more basic reason, however, for conducting a review of backgrounds at this point. The review forms a key component of the research design of the program in that it provides a basis from which to decide to what extent the participating students are representative of the larger group from which they came. It also provides a basis from which to understand those variations in response rates which do occur, and to gain a picture of the data on participants as a whole, prior to examining segments of the data in closer detail. In this way it will be possible to assess the general applicability insights arising from observations about the participating students, as well as to understand factors which may mitigate against accurate interpretation of data collected from the respondents.

As well as having been necessary to identify and understand any trends which may have influenced responses to the invitation to participate in the program, thereby causing differentiation between the participating and non-participating groups, it was important to assess and account for any differences in the response patterns between the two years in question. This is because any differences between the results obtained from data from the 1993 and 1994 cohorts must be considered and interpreted in light of any differences of composition which may exist between the cohorts themselves. Moreover the repetition of analysis across two cohorts may serve to add strength to the inferences which may be drawn from the data, an observation which applies equally well to the appraisal of sample representativeness as it does to the more central purposes of the program. This process is therefore a crucial part of the methodology, but is in itself also a partial test of the methodology.

5.1 The Group Under Scrutiny

Bearing in mind the criteria for participation in the program which have previously been indicated, mechanisms were established by which to identify those students who had first enrolled at the University in 1993 and 1994, who met each of the criteria and were therefore potential participants. Once identified, these students formed the target group for the program, and were invited to participate. Since not all of those who were invited to participate in the program chose to do so, the total group of those who were invited are referred to herein as the target group, and the smaller group who chose to take part are referred to initially as the respondents and, if they proceeded to gain one or more results for their first year studies, as participants (there being insufficient data from which to commence analysis of students who responded but then did not proceed with their studies).

It was not difficult to identify newcomers to the University. In both 1993 and 1994, all students enrolling for the first time at the University were allocated a seven digit identification number, of which the first two digits represent the year in which their enrolment record was created. The University administration retains this number throughout the history of a student's enrolment in one or more courses at the University. Thus only those students with 93***** or 94***** identity numbers were included in the target group.

As well as limiting participation in the study to newcomers to the University, the process of selection of the target group entailed the

exclusion of all but undergraduate award course students studying at level one. This was achieved with relative ease by reference to relevant data fields within the files of enrolment records provided by the University. Thus information about TAFE, postgraduate and *non-award studies* ('single subject') and *later year entry* students has not formed part of the data under review.

Except as indicated above, no conditions have been observed; all fields and disciplines taught at higher education undergraduate level have been included in the program, and are represented in this review, and both local and international students (provided they were studying onshore) have been examined.

5.2 Response Rates

For the reasons outlined above, the combined target group and the respondents from 1993 and 1994 have been reviewed, as well as having been examined separately and compared.

In 1993, of the initial target group of 2,469 newcomers enrolled in undergraduate higher education award courses at the University, there were 2,224 who were still enrolled after the second semester enrolment census date (ie after 31 August 1993). A further 245 students were enrolled in first semester, but had since discontinued studies or transferred. Figure 5 shows in detail the enrolment status of the members of the original 1993 target group of 2,469 students, as held in University records during September 1993.

Figure 5. Breakdown of enrolment status of the 1993 target group and survey respondents.

Current Status		Number of Students	Number of Survey Respondents	Response Rate %
ENR	Currently Enrolled	2,224	1,460	65.6%
DEF	Deferred commencement	3	2	66.6%
LOA	On Leave of Absence	81	33	40.7%
LPS	Lapsed – Fees unpaid	56	19	33.9%
TFR	Transferred course	13	6	46.2%
UNK	Moved - Unknown Address	14	0	0.0%
WDR	Withdrawn	78	25	32.1%
	Total	**2,469**	**1,545**	**62.6%**

In 1993, a total of 1,545 survey responses were received and logged, among them being responses from 1,460 students who were still enrolled during second semester and who comprised 65.6% of the continuing members of the target group.

At the outset, the proposed methodology was acknowledged to depend upon a relatively high response rate. This was seen to be necessary in order to sustain a methodology where data were to be charted and profiled for subsequent analysis, rather than subjected to treatment such as regression. It is perhaps worth observing that a sample of significant size would be of value, even if regression or other techniques of statistical adjustment were to be applied, there being no substitute for real information. Hence a majority response rate (ie 50% or greater) was considered highly desirable, and a return in the range from 2/3 to 3/4 was identified as a notional, albeit ambitious, goal.

As can be seen at Figure 5 (above), the response rate from the first cohort was well above 50% and in fact came close to the range ideally sought. This was a pleasing result, leading to the view that the data yielded from the exercise would provide a solid basis for the investigation which was to follow. The 1993 result also fuelled some expectations and a little optimism concerning the prospect of achieving an adequate return in the following year also. Figure 6 provides a view of the outcome of the survey in 1994 in the same format in which data pertaining to the preceding year appear at the previous figure.

Figure 6. Breakdown of enrolment status of the 1994 target group and survey respondents.

Current Status		Number of Students	Number of Survey Respondents	Response Rate %
ENR	Currently Enrolled	2,555	1,467	57.4%
DEF	Deferred commencement	9	2	22.2%
LOA	On Leave of Absence	140	49	35.0%
LPS	Lapsed – Fees unpaid	18	4	22.2%
TFR	Transferred course	64	24	37.5%
UNK	Moved - Unknown Address	22	0	0.0%
WDR	Withdrawn	125	26	20.8%
	Total	**2,933**	**1,572**	**53.6%**

A comparison between the summaries presented at Figures 5 and 6 enables one to readily observe that there was much in common between the two years in respect of the enrolment patterns and survey returns.

There was an increase of 18.8% in the size of the intake between the two years, consistent with the effects of two factors operating in

combination: the allocation of quota load to the University increased slightly in 1994 and a marginal economic upturn, with its attendant improvements in employment prospects for students, gave rise to increased attrition amongst returning students, so the University increased its intake in order to achieve overall quotas. The second of these reasons also accounts for an increase in the attrition, during first year studies, by members of the target group: in 1993 the total attrition during first years (the aggregate of all statuses except ENR and UNK) was 231, or 9.4% of the 1993 target group; in 1994 the total attrition was 356, or 12.1% of the corresponding group. Similarly one might regard the disproportionate increase in the number of members of the target group whose mail was returned unopened as being attributable to the effects of economic trends insofar as students move house according to their financial and/or employment status, and, therefore, a shift in the employment market could be expected to be associated with an increase in student mobility.

A further marked disparity between the enrolment profiles for the two years under investigation is a larger number of lapsed students and fewer withdrawn students in 1993 than in 1994. This can be accounted for by a change in administrative practice at the University between the two years so that, in 1994, students whose enrolment had lapsed due to non-payment of fees were subjected to a more expeditious follow-up process and, if they still did not respond, their enrolment status was converted to WDR by the administration. This alteration to procedure within the administration accounts both for a slight reduction in the combined number of LPS and WDR students from 5.4% of the target group in 1993 to 4.9% in 1994, as well as for the

apparent population shift from LPS to WDR in the enrolment data for 1994.

In 1994, a majority response rate was again achieved, although the percentage was not quite as high as that achieved in 1993. Several factors do, however, lessen any concern which might arise as a consequence of the reduced rate of return. In 1994, proportionally fewer respondents (than in 1993) were among those students withdrawing from studies before achieving any results, thus rendering a larger proportion of the 1994 responses useful to the program. Moreover the total number of students in the target group for 1994 was sufficiently large that despite the slightly lower response rates, the net number of respondents was still larger than in 1993. This means that sufficient data were available from both years to facilitate sample groups of workable sizes (as described in a later chapter) and to facilitate comparable treatment of the data from the two cohorts.

Comparisons between data yielded by participants in each of the years under scrutiny proved particularly interesting because of the changed circumstances, as outlined above, which prevailed at the times of admission and course commencement for the two cohorts.

The overall rates of return from the four mailouts of invitation packages (an initial mailing and a follow-up mailing in each year) are presented at Figure 7. The combined first year attrition rate was 10.9% (587 members of the target group). As can be seen on the final line of Figure 7, the overall response rate was 57.7%.

Figure 7. Overview of enrolment status of the 1993 and 1994 target groups and respondents.

Current Status		Number of Students	Number of Survey Respondents	Response Rate %
ENR	Currently Enrolled	4,779	2,927	61.2%
DEF	Deferred commencement	12	4	33.3%
LOA	On Leave of Absence	221	82	37.1%
LPS	Lapsed – Fees unpaid	74	23	31.1%
TFR	Transferred course	77	30	39.0%
UNK	Moved - Unknown Address	36	0	0.0%
WDR	Withdrawn	203	51	25.1%
	Total	**5,402**	**3,117**	**57.7%**

In reading and interpreting the data presented at Figures 5, 6 and 7, it is worth considering for a moment which students can be regarded as suitable participants in the program. At first glance, one might assume that students who chose to withdraw from enrolment in one way or another would not, or could not, be included in the investigation even if they had opted to return the survey and thus expressed their willingness to participate. Indeed, it may be that students themselves made such an assumption and this may in part account for the fact that the response rates among all categories of students withdrawing from study are significantly lower than from continuing students. It must be recognised, however, that students withdraw from study for a variety of reasons and these are not always obvious, nor can they be reliably determined from the available data. One such reason is that the student her/himself realises that the results being achieved are not satisfactory, so a proportion of withdrawals are associated with low success. Conversely, some students who withdraw do so for other reasons, some of which could

be associated with success in the course. An example of this would be a student who, on the basis of excellent results in early studies, accepted an invitation to transfer to another course (perhaps at another institution) which he/she considered more suitable or more challenging. In either case the fate of these students has a bearing on the aims of this study, in so far as it seeks to investigate relationships between students' backgrounds and their academic achievements.

Clearly then, to exclude withdrawing students from the investigation could be to ignore relevant data on the success (or otherwise) of the group under scrutiny. Consequently, all respondents who have achieved one or more results in their first year studies, and who responded to the invitation to participate, have been included in the study, and it is this group which are henceforth referred to as the participants. Among the 3,117 respondents there were 3,086 participants, being 1,530 from the 1993 cohort and 1,556 from the 1994 cohort, from a total of 5,306 members of the original target group who obtained results (and would, thereby, have been eligible for inclusion in the program, had they chosen to participate). The effective overall participation rate (after respondents who did not obtain any first year results were eliminated) was therefore 58.2% (ie 3,086 students).

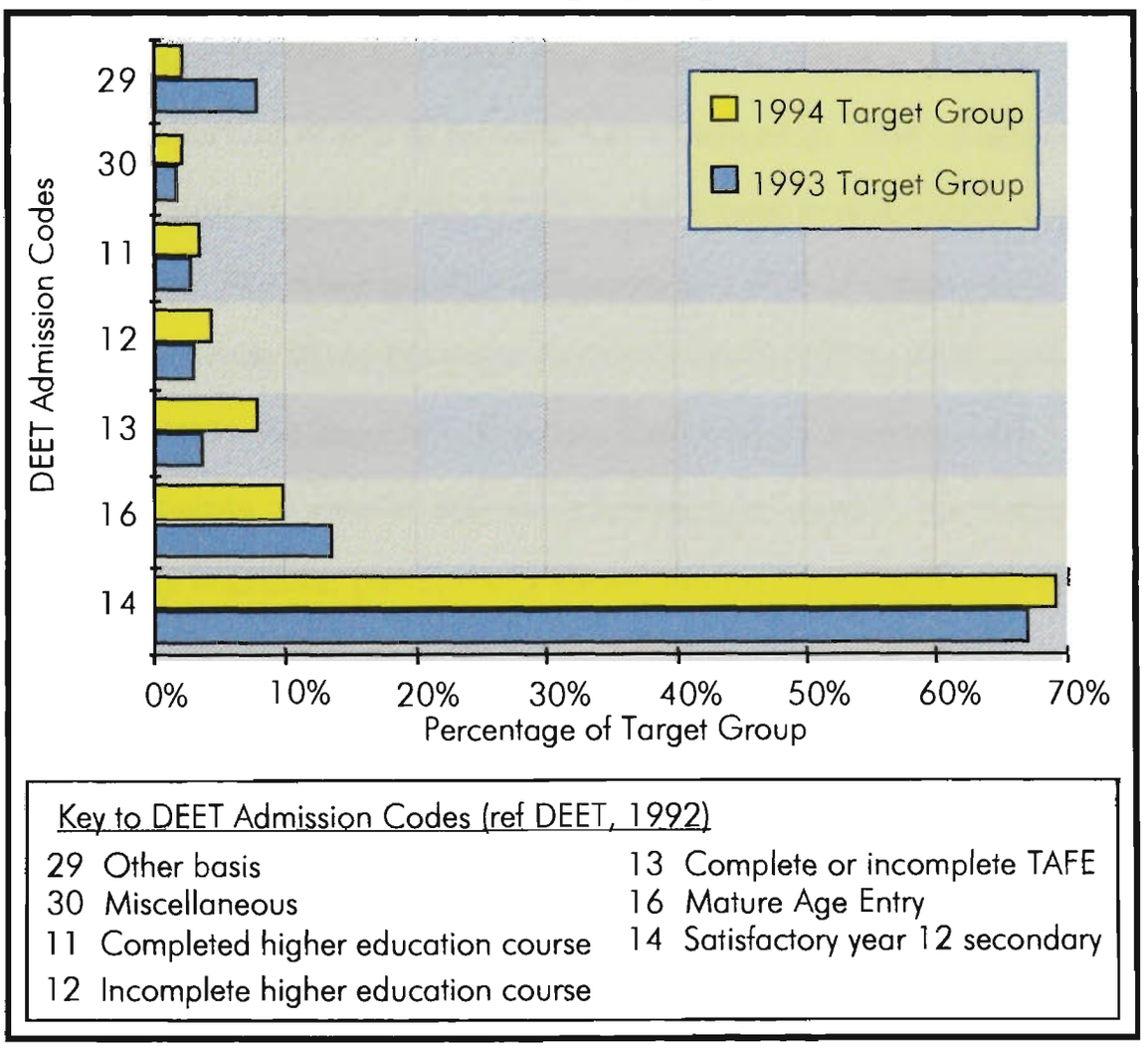
In all, the participation rates met the aims of the program and provided a satisfactory basis for the analysis which was to follow.

5.3 Categories of Entrants

The 'basis of admission' of new students is perhaps the simplest and most obvious indicator of the composition of a cohort. An element of

enrolment data about new students within the University relates to the basis of the selection decision leading to their admission to a course. This information is currently categorised into ten broad groups (Department of Employment, Education and Training, 1992). No specific information, however, is available in relation to 4.9% of the target group (who were coded in University records as 'other basis'). A summary of the basis of admission data showing each of the cohorts separately is graphed at Figure 8.

Figure 8. Comparison of main categories of basis of admission of total 1993 and 1994 target groups.



As can be seen at Figure 8, in both 1993 and 1994 a single category, Satisfactory completion of Year 12 studies at a Secondary School, is predominant, accounting for 68.3% (3,692 entrants) of the intake

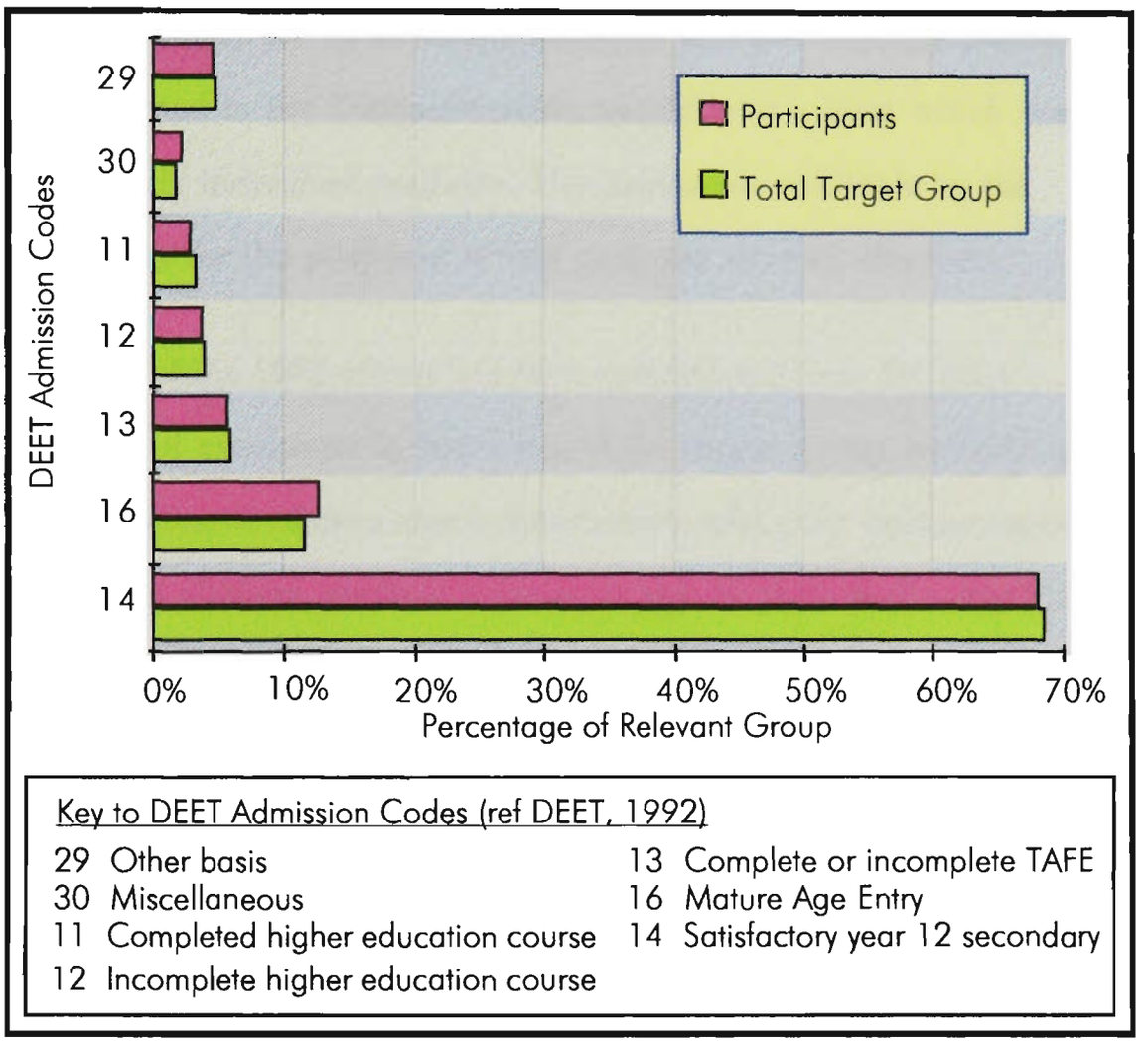
overall. Of the other ten categories only five (including 'Other basis') are shown, and the remaining five categories are grouped under 'miscellaneous' because the numbers involved are small.

As well as providing a view of the composition of the undergraduate intake in the years in question, the data graphed at Figure 8 show that the general composition of the intake followed broadly similar lines in the two years being studied.

Two notable differences exist between the basis of admission data which were collected by the University from the members of the target groups for 1993 and 1994. One difference is that a slightly higher proportion of school leavers was admitted in 1994 consistent with the requirements of the DEET institutional profile which applied in that year. The other notable difference is a shift of intake from Mature age (code 16) to the prior studies codes (11, 12 and 13) between 1993 and 1994. An inquiry within the University administration however, points to greater attention having been paid to the coding of prior study entrants, particularly those coming from TAFE in 1994 (arising from input from a 'Pathways' project (Victoria University of Technology, 1994, pp12-32), and a desire to more closely track students articulating from TAFE to Higher Education and vice-versa) and it appears likely that this accounts for the difference, rather than any re-apportioning of quotas or intake patterns. Similarly, the reduction of the number of entrants coded non-specifically (29 - Other basis) can be explained in terms of an improvement in the accuracy of the coding procedure rather than any shift in selection practices applied by the University.

It is also important to consider whether the survey respondents can be regarded as representative samples of the target groups, and the basis of admission categories provide one avenue through which this can be verified. To achieve this, a breakdown of the basis of admission among the participants must be compared with the equivalent data on the target group as a whole. This comparison was made for each of the years taken separately and then for the combined group.

Figure 9. Comparison of main categories of basis of admission of the participants with the target group (both cohorts).



The graph which appears at Figure 9 (above), indicates the relative proportions of each of the categories of admission basis, for both the target group as a whole and the participants. The equivalent charts

showing a comparison for each of the years taken separately, follow a very similar pattern, and therefore have not been reproduced here.

5.4 Profiles of the Target Groups

A range of statistical information is collected at the time of enrolment by way of questions to which enrolling students are required to respond during the course of the enrolment process. These questions are primarily those required by Commonwealth and State funding bodies as a condition of annual grants to institutions. As such they are compulsory for all enrolling students and the answers provided are returned to the Commonwealth annually in a form which does not identify individual students. The data made available by the University for the purposes of this program were in this form.

A profile of the 1993 cohort has been constructed from the data provided at enrolment by members of the target group, containing fifteen elements of data about the students and their backgrounds. Each data element graphed represents the proportion of a specific minority group as a percentage of the whole group.

Each of the fifteen elements used to construct the profile is briefly described below:

1. Mature Age – the percentage of students who were 21 years of age or older on 1st January 1993
2. Part-time – the percentage of students who are undertaking a part-time study load in 1993
3. Male – a gender balance measure; the percentage of male students
4. Born Overseas – the percentage of students who were born outside Australia

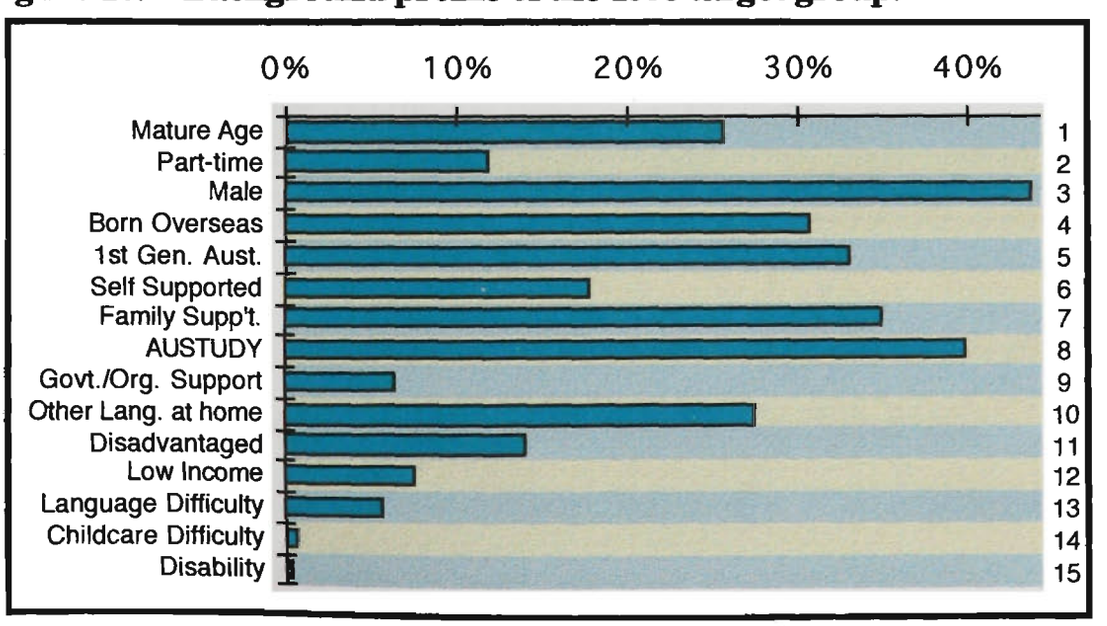
5. 1st Gen Aust. – the percentage of students who were born in Australia, but one or both of whose parents were born outside Australia
6. Self Supported – the percentage of students whose main source of financial support is employment, own savings or a loan
7. Family Supported – the percentage of students whose main source of financial support is Parents, Guardians, Brothers, Sisters, Relations, Spouse or Partner
8. AUSTUDY – the percentage of students whose main source of financial support is Austudy payments
9. Govt./Org. Support – the percentage of students whose support is provided by government (other than Austudy), employer or scholarship
10. Other Lang at Home – the percentage of students who regularly speak a language other than English in their home environment
11. Disadvantaged – the percentage of students indicating disadvantage
12. Low Income – the percentage of students who indicated that income difficulties may adversely affect their academic performance
13. Language Difficulty – the percentage of students who indicated that language difficulties may adversely affect their academic performance
14. Childcare Difficulty – the percentage of students who indicated that childcare difficulties may adversely affect their academic performance
15. Disability – the percentage of students who indicated that disability may adversely affect their academic performance

At this point it must be noted that, for 1994, the University made several changes to the structure of the questions on its enrolment stationery, so that the statistical information available in respect of the 1994 cohort, regrettably, does not precisely match the data available for the preceding year. The changes did not greatly affect the form of the questions from which data for the first nine of the elements described above were drawn. The tenth element, language other than English spoken at home, was changed, with the question

being reworded in an effort to improve its clarity. The data yielded by the new question are interesting in their own right and have therefore been included in the profile exercise for the 1994 group. However, the value of the tenth element for comparison between the cohorts is questionable. The remaining five elements (11–15) were not available in 1994, the question(s) from which they were drawn having been removed and replaced with a series of more narrowly focussed questions which did not produce sufficient data to be of use for profiling. Only the first ten elements of the profile, therefore, have been applied to the 1994 group.

A profile of the 1993 target group of 2,469 new level one undergraduate students, based upon the above fifteen elements of data, is shown at Figure 10. This profile provides a benchmark for comparison with sub-groups drawn from the 1993 pool of enrolling students, as well as enabling comparison on the first nine elements, with a corresponding profile for the 1994 group.

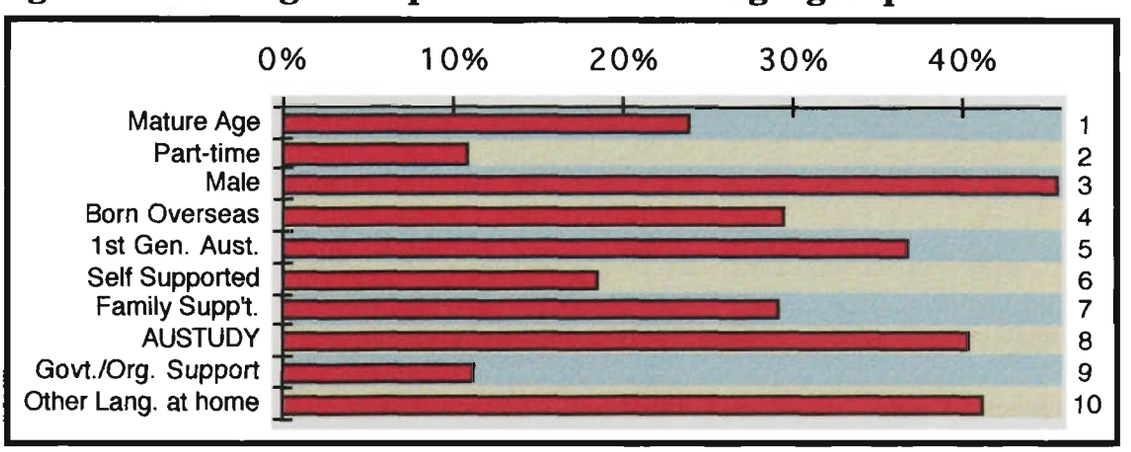
Figure 10. Background profile of the 1993 target group.



It is perhaps worth noting at this point, that the first element of the profile bears no relation to the category of admission for mature age applicants which was presented in the data at Figures 8 and 9. Whereas all applicants for admission are considered in one or other of the several categories of eligibility, the element charted above also includes all those students who were admitted in other categories, but are nevertheless over 21 years of age.

Along the same lines as for 1993, a profile of the 1994 target group of 2,933 new level one undergraduate students has been prepared and is reproduced at Figure 11. As indicated previously, differences in the nature of the data available in 1994 have resulted in the profile necessarily being limited to the first ten elements used in the preceding year.

Figure 11. Background profile of the 1994 target group.

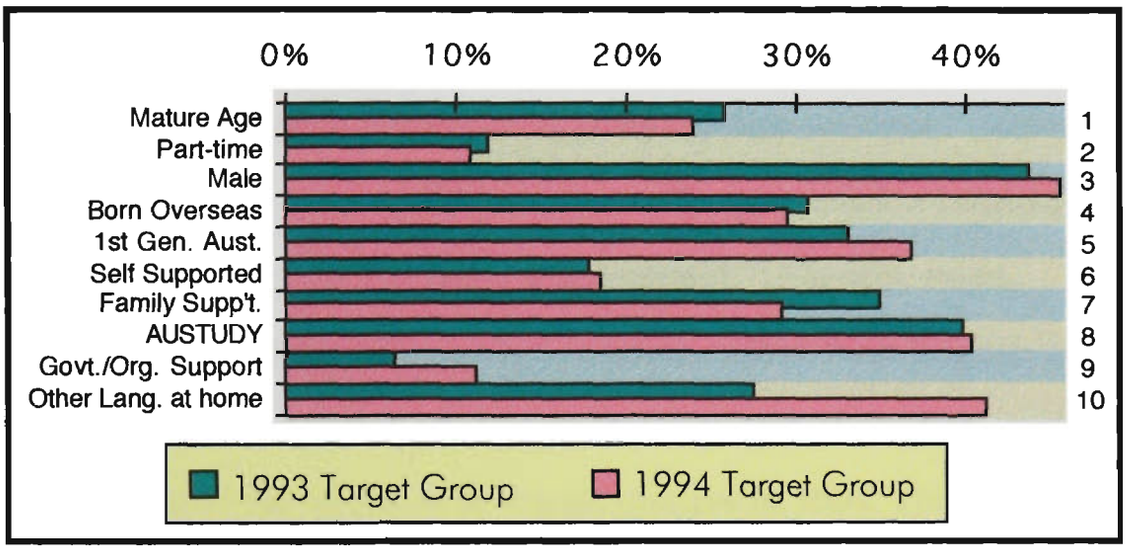


The aspect of the profiles shown at Figures 10 and 11 which is of most immediate interest is the information they provide about the relationship between the two cohorts. Previously, in examining the categories in which students were admitted to their respective courses, it was apparent that, in respect of admission, the 1993 and

1994 cohorts of entrants were comparable (ref. Figure 8 above). It remained possible, nevertheless, that within those categories, students with a different mix of background may have been admitted.

To facilitate a direct comparison of the profiles of the 1993 and 1994 cohorts, the bar graph data for 1994 have been superimposed on the data for the first ten elements of the 1993 cohort profile. The resulting composite chart appears below as Figure 12.

Figure 12. Composite chart showing the profile of the 1994 target group overlaid upon the profile of the 1993 target group.



Comparison of the first nine elements of the profiles which are overlaid at Figure 12 shows a high level of similarity between the proportions of the minority groupings plotted within each cohort. Only three of the first nine factors varied by 2% or more, those being: first generation Australians (+3.7% in 1994), students supported primarily by their families (-5.8%) and students receiving Government or organisational support (+4.7%). Of these, the larger two can be assumed to be co-dependent and to be linked to, or reflect, shifts in the economy which have been commented upon previously.

The shift in the number of first generation entrants is not readily explicable in terms of a link to the changing demographic profile of the region within which the University resides. The variation is nevertheless of an order which falls within the ambit of ordinary annual fluctuations in student populations, being, for example, much smaller than the increase in the overall size of the undergraduate intake between the two years in question (18.8%).

As was indicated earlier, the enrolment question which yielded the data for the tenth element in the profiles was re-worded for 1994 by the University administration. In 1993 the question commenced with the words "Is English the main language spoken at home?" whereas in 1994 the more open wording used was "Do you speak a language other than English in the home environment?". Clearly, some students who occasionally speak a language other than English at home, even though they might be native speakers of English, could have answered the question in the affirmative in 1994. Thus there are at least two factors which might be assumed to contribute to the marked increase in the proportion of students indicating that they speak a language other than English at home between the two years (+13.7%). The first factor would be an assumed co-dependant link between the 'language spoken at home' and 'first generation Australian' elements of the profiles. The second factor is the greater openness of the wording of the relevant question at enrolment.

For the purposes of the program, it has been assumed that the variation between the cohorts in relation to the tenth profile element is not significant, and that the composition of the cohorts is consistent

to the extent demonstrated by the nine profile elements which the years have in common.

5.5 Representative Sampling

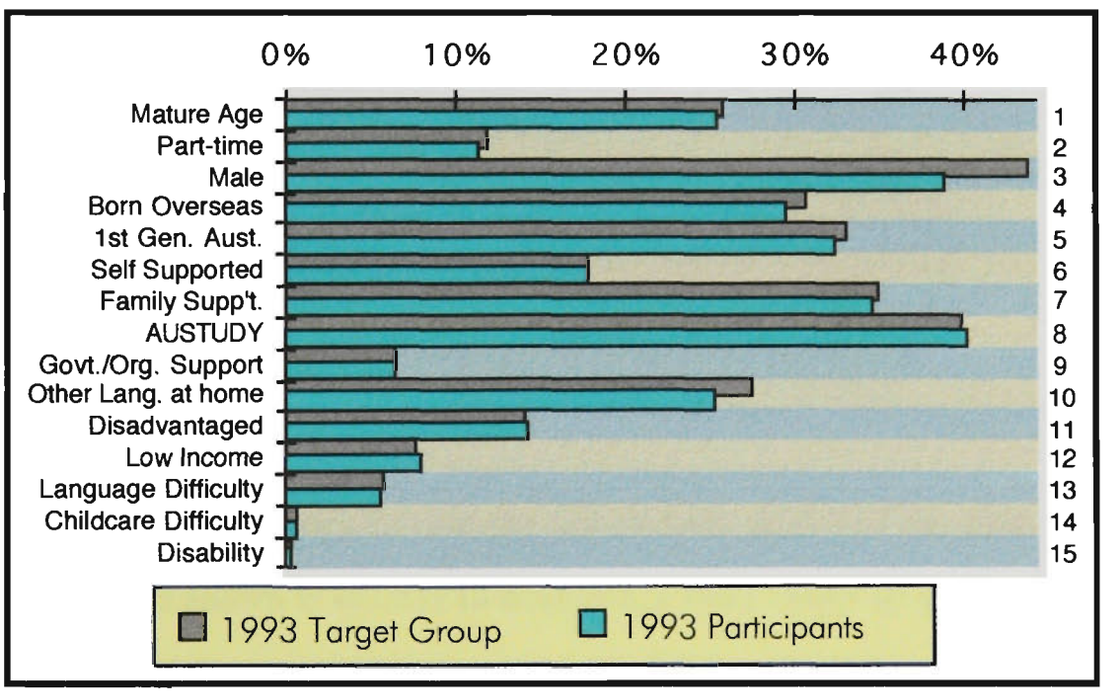
The answers which students have provided to the statistical questions at enrolment enable the construction of a more general profile of the group than that afforded by the basis of admission examined above. Such a profile is of interest insofar as it provides a detailed view of the social and cultural composition of the target group. The profile is useful beyond general interest, however, in that it also affords a basis for comparison between sub groups or samples (including the group who responded to the invitation to participate in the program) and the original pool of entrants.

The process of profiling which is used here is a first step in the process of validating the data which will provide the basis of sampling later in the program. It has been adapted from procedures described in recent studies of techniques of evaluation in education (Wolf, 1990) and formulated according to the available data. Beyond comparison of the cohorts (above), the first such validation entails a review of the participating group to consider whether the respondents were a representative sample of the target group. Arising from the review it is necessary to ascertain the nature and extent of any variance, to explore possible reasons for non-representative sampling and to consider what effect this may have on the program.

5.6 Profiles of Participants

A visual representation of the profile of the 1993 participating group (a subset of the 1993 target group) has been prepared using the same technique applied above, and is shown at Figure 13. To facilitate comparison with the reference profile which appears at Figure 10 (above), the data from Figure 10 have been incorporated as a dark grey background shadow behind the data on the 1993 participants. This provides a view of the differences in the mix of students who responded to the invitation to participate in the program in 1993. The process is one in which any small trend away from representative sampling can be readily detected.

Figure 13. Background profile of the 1993 participants, overlaid against the profile of the 1993 target group.

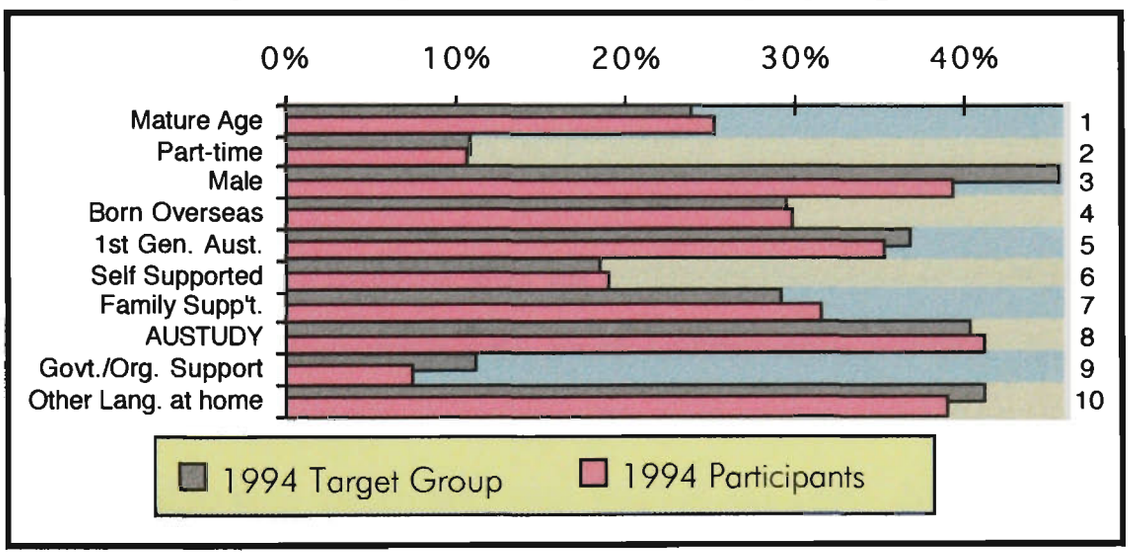


As can be seen, the fifteen-element profile of the 1993 participants shown at Figure 13 is a close match for that of the original target group data from Figure 10. Only three of the fifteen minority

indicators varied by one percent or more. These were male gender (4.9%), other language at home (2.2%) and born overseas (1.2%). In each case the relevant minority group were under-represented among the respondents.

In a similar way, a profile of the 1994 participants, this time based only upon the ten elements which were available from enrolment files for 1994, has been overlaid upon the profile of the 1994 target group from Figure 11, to provide a comparison of the respondents in 1994 along the lines of that produced above for the 1993 group.

Figure 14. Background profile of the 1994 participants, overlaid against the profile of the 1994 target group.



It can be seen at Figure 14 that the ten element profile of the 1994 participants shown is similar to that of the 1994 target group data from Figure 11, as was the case with the 1993 participants. Moreover the most notable difference between the mix of students responding in 1994 was again gender, this time by an increased margin (6.2%). There was a similar shortfall in students reporting a language other than English spoken at home (2.3%), and also in those students

dependent upon Government or employer support (3.6%). Again, in each case the relevant minority group were under-represented among the respondents.

5.7 Possible Reasons for Response Patterns

The under-representation in 1993 of students who were born overseas and students who speak a language other than English at home can be assumed to be linked, since a high proportion (61.2%) of students who indicated they spoke a language other than English at home also indicated that they were born overseas. It is, therefore, reasonable that the under-representation of students who speak a language other than English at home was, in 1993, accompanied by an under-representation among students born overseas of the magnitude which occurred.

It is not difficult to imagine why an under-representation of students born overseas and students who speak a language other than English in the home environment occurred, given that 94% of students who reported that they anticipated that English Language difficulties might impede their studies also indicated that they spoke a language other than English at home. The additional burden for those with language difficulties, of completion of a survey and even comprehension of the implications of the covering letter, despite the effort made to make them both simple and direct, might well account for the lower rate of return from these students. This appears to be borne out by the recurrence of an under-representation of the same order on the language other than English element in 1994.

In both instances, the magnitude of the differentiation between the respondents and the target group, being of the order of 2%, was unlikely to have a measurable impact upon the later grouping and analysis of the data.

Among the 1994 participants, there was a small under-representation of students reliant upon government or employer support (3.6%), which was not matched by a like occurrence in 1993. Although it is not clear why this occurred, the variance is of an order which is unlikely to have any discernible effect on subsequent analyses of the data.

A more noteworthy difference in the profiles of the two groups of participants, as represented at Figures 13 and 14, is the greater proportion of females among the respondents in both years. This was surprising and gave rise to reflections on the question of whether it might reveal something about the questionnaire design, or lend further credence to theories about gender predispositions among contemporary youth, which have been shown to affect the outcomes of some forms of selection for higher education (Adams, 1984).

As was reported in the preceding chapter, the letter accompanying the questionnaire was designed to appeal to the altruistic sentiments of the reader, stressing the possible benefits of the program to future students, whilst the questionnaire itself was designed to appear as compact and non-challenging as possible. There is room for conjecture that either or both of these design features influenced the mix of respondents, contributing to the gender bias of the

respondents. It is also noteworthy that the response rates were high, with almost 43% of the initial target groups responding to the first questionnaire mailouts across both years, and around a further 15% of the initial groups responding to the second rounds of letters. If the letter and questionnaire design were responsible for the gender bias of respondents, they may also have assisted in the achievement of a very satisfactory response rate overall.

A gender analysis of the response rates in each of the mailing batches for both years combined (the pattern in each year was similar) appears at Figure 15. Given that a good initial survey response is of the order of 35% (Walford, 1991), it can be seen that the initial return from the male students was very good, being 36.4%, but the return from females was spectacularly high at 48.1%. This skewing of return rates was much less pronounced among those who responded to the second batch of questionnaires, with only 1.2% variation between the rates of return.

Figure 15. Gender breakdown of survey responses (1993 and 1994 combined).

Gender	No in both Target Groups	No in 1st Returns	% in 1st Returns	No in 2nd Returns	% in 2nd Returns	Overall % responses
M	2,428	884	36.4%	345	14.2%	50.6%
F	2,974	1,430	48.1%	458	15.4%	63.5%
All	5,402	2,314	42.8%	803	14.9%	57.7%

Whilst the gender bias of the early response rate is of interest, it is not of a sufficient order of magnitude to be of concern or to compromise

the primary objects of the program unless it is linked to some other bias which is not evident in the fifteen-element profiles which appear above. One possible link which is worth exploring, is that of field of study. Since there is a marked gender bias in the student populations within some fields of study (Dobson & Sharma, 1993), it is possible that the gender bias of the returns conceals a significant bias between the fields of study of respondents. An analysis of respondents by faculty, compared against the profile of the target group, is the simplest way to test this theory.

Figure 16 (below) shows an analysis of the survey returns by faculty. It can be seen that the rate of return from the Faculty of Engineering is lower than from other faculties, while returns from the Faculty of Human Development were high. This is in keeping with the overall gender mix of the two faculties wherein Engineering has a majority of males (85.1%) in the combined target group, while Human Development has a majority of females (74.6%).

Figure 16. Breakdown of survey returns by faculty (1993 and 1994 combined).

Faculty	Total No	% of Total	Responses	% of Responses	Difference
Arts	792	14.7%	471	15.1%	+ 0.4%
Business	1,887	34.9%	1,048	33.6%	– 1.3%
Engineering	736	13.6%	351	11.3%	– 2.4%
Human Development	1,158	21.4%	761	24.4%	+ 3.0%
Science	829	15.3%	486	15.6%	+ 0.2%
Totals	**5,402**	**100.0%**	**3,117**	**100.0%**	

NB: Rounding errors account for the fact that the 'Difference' column at the right does not sum to zero.

It has been demonstrated that a disproportionate distribution is most readily observed against factors most closely linked to the cause of the unevenness (Cochran, 1983). The imbalance between the overall response rates from students studying in the five Faculties, as shown in the right-hand column of Figure 16, is not as great as the 4.9% and 6.2% variation in gender representation observed on the comparative data element profiles at Figures 13 and 14.

In light of these results it is, therefore, reasonable to conclude that the Faculty distribution of participants, and the distribution among fields of study which lies behind it, is a consequence of the gender bias rather than its cause.

5.8 Implications of the Profiling Exercise

Having conducted a detailed review and comparison of the composition of the 1993 cohort, including comparing the cohorts with each other, and comparing participants with the target groups from which they are drawn, it has been established that no major departures from representative sampling have occurred. Those departures which have been documented and discussed above, are not of an order of magnitude which could reasonably be regarded as compromising the central aims of the program.

Although not of a size which called into question the viability of the proposed analysis of the survey data, the over-representation of females among the program participants presented an issue which required attention and consideration as subsequent analyses proceeded. Particular attention has, therefore, been paid to all sub-

groupings and samples elsewhere in the study where gender balance is further skewed. The primary object of the continuing special attention to gender has been to ensure that general assumptions have not been made in the interpretation of indices later in the program which cannot be assumed to apply outside the context of the program participants by reason of gender over-representation.

Chapter 6:

Dimensions of Diversity

6.1 Who Comes to University

The preceding chapter provided a purposeful review and a limited overview of the composition of the group of undergraduate higher education students who were the target group for this program. In this chapter, the overview of respondents will be extended and subjected to detailed analysis, with particular emphasis on the social and cultural backgrounds of the subjects of the study.

There has been a longstanding interest in questions about who studies at university, why and with what effect. The information which was utilised in the foregoing profiling exercise was available, incidentally and opportunely, because of the requirements of Federal and State funding bodies for detailed feedback on the recipients of their support.

Placed in a longer term historical context, the scrutiny of higher education and the populations it serves and neglects to serve forms part of an ongoing and increasing interest in the changing face of higher education (Newman, 1915; Ling 1984) and its role in social change (King, 1971). Whereas much attention has been given to the participation of a traditional elite in higher education systems both in Australia and internationally, as well as to various correlates (most

relatively weak) of success within that framework, this study seeks to apply comparable ideas to less traditional backgrounds and contexts.

As has been documented in earlier chapters, considerable interest has developed and has been focussed during the latter half of this century on academic performance and its correlates, and the participation of Australian researchers in this sphere has been well documented (McDonell, 1975). Relatively few Australian studies bear directly on the evolving context where increasing internationalisation, recognition of multiculturalism and increasing emphasis on access and equity all combine to force a new focus on diversity. Several recent Australian studies of student achievements (eg. Hopkins, 1988; Manning, Killen and Taylor, 1992; Dobson and Sharma, 1993) have provided useful insights, but have not sought to highlight ethnographic or cultural considerations. Other recent Australian studies have provided some insights into the performance of sub-groups as an adjunct to their primary focus (Lewis, 1994; Long, 1994).

For a decade, internationalisation has been a significant force in Australian undergraduate education (Marginson, 1993). As part of this program, in setting out to examine non-traditional as well as traditional backgrounds among students, it was considered advantageous to first examine diversity and its effects in the contemporary context. Moreover, reappraisal of the dimensions of student intakes is timely in light of the consolidation of movement towards a mass higher education system which is well established in Australia in the 1990s (McCallum, 1990; Stanley, 1995) with more

than 50% of school leavers entering some form of post-compulsory education in Australia in 1994 (Moran, 1995), and especially, in light of the direction of Federal education policy designed to ensure that the diversity present in the communities served by higher education is increasingly reflected in the profile of their intake (Martin, 1994).

As was argued in a recent paper, an awareness of the associations between students' motivation, factors in their background/life circumstances and academic outcomes is likely to be of increasing strategic importance to institutions as they position themselves to deal with hitherto unknown levels of internationalisation and cultural diversity (Cologon 1995c).

6.2 Cultural Origins and Language

To commence with a general investigation of diversity within the ambit of this program, the composition of the 1993 and 1994 groups of participants has been examined and compared, including comparisons between aggregated data on the subsequent academic performance of particular culture and language sub-groups.

The first two indicators of cultural origin which are examined are country of birth and language spoken at home. An overview of the participants on each of these two criteria, as presented at Figure 17, gives a general picture of the composition of the group.

As can be seen at Figure 17 (below), the participants were comprised of 28.4% immigrants and an even greater number (35.6%) of first generation Australians (in respect of one or both parents), together

making up almost two thirds of the group. Moreover, approximately one third indicated at the time of enrolment, that a language other than English was spoken at home.

Figure 17. Overview of participants by birthplace and home language.

	No of Students	% of Total
Born outside Australia	877	28.4%
Australia-Born, both parents born o/s	726	23.5%
Australia-Born, only Father born o/s	237	7.7%
Australia-Born, only Mother born o/s	135	4.4%
Student & parents born in Australia	1,111	36.0%
All Participants	3,086	100.0%
Language other than English as main language still spoken at home	999	32.4%
English Language Speakers	2,087	67.6%

In both respects, as demonstrated in the preceding chapter, the composition of the participating group is closely analogous to the total higher education undergraduate level one intakes in the years 1993 and 1994 at Victoria University of Technology, given that variations from the reference group were of the order of 2% or less on all tested criteria except gender, where females were over-represented among the respondents by 5.5% overall.

As an indication of the spread of cultural diversity, a table setting out the region of origin of the group of participating students who were born overseas appears as Figure 18. The 877 students in question were distributed among 83 country categories, with only four

countries contributing more than 30 students, and three countries contributing more than 35 students (these being Hong Kong, the United Kingdom and Vietnam).

Figure 18. Breakdown by region/country of birth, of 877 participating students who were born outside Australia.

Geographic Region	Number of Students	Selected Significant Countries
North-East Asia	87	Hong Kong (42 students)
		China (30 students)
Central Asia	35	Sri Lanka (20 students)
		India (12 students)
South-East Asia	341	Vietnam (255 students)
		Cambodia (21 students)
Pacific Ocean Countries	79	Philippines (32 students)
		New Zealand (22 students)
Middle-East	43	Turkey (15 students)
		Lebanon (9 students)
South America	40	El Salvador (12 students)
		Chile (10 students)
Europe	194	U.K. (inc. Nth Ireland) (82 students)
		Poland (21 students)
		Yugoslavia (15 students)
North America	9	Canada (5 students)
		U.S.A. (4 students)
Africa	40	
USSR	9	

NB: 83 country categories are represented among the original data, and have been grouped by geographic regions here for the sake of brevity.

With such a wide distribution of countries of origin, and relatively small numbers from each country, there is little merit in tracking

the particulars of individual country sub-groups (in any case many of the samples would be too small to produce meaningful data), and therefore, attention has been focussed on the ten broad categories listed in the overview at Figure 18.

An expanded table which provides frequency of occurrence by individual country categories is attached at Appendix 6. A comparable analysis of the countries of origin of the parents of first generation Australian students, and of the languages other than English spoken at home by participating students, has also been undertaken, and showed a similar spread (one might say intensity of diversity) as the data reproduced above.

Figure 19. Data for profile of survey respondents by age, study mode, gender and income.

	Mature Age	Part-Time	Male	Self Supp-orted	Family Support	Austudy/ Abstudy	Gov't/ Org Support
Born outside Australia	386	61	431	109	214	510	102
Second generation Australian	170	52	407	193	393	410	66
Student & parents born in Australia	246	61	391	277	421	341	81
All Participants	802	174	1,229	579	1028	1261	249
Language other than English at home	317	60	451	96	252	594	73
English language speakers	485	114	778	483	776	667	176
Born outside Australia, English speaking	114	18	126	64	90	79	48
Born outside Australia, non-English-speaking	272	43	305	45	124	431	54

Figure 20. Data for profile of survey respondents by self-assessed disadvantage.

	Disadv-antaged	Low Income	Language Difficulty	Childcare Difficulty	Disability
Born outside Australia	518	276	304	31	12
Second generation Australian	318	287	21	11	20
Student & parents born in Australia	334	300	1	29	22
All Participants	1,170	863	326	71	54
Language other than English at home	580	333	308	26	18
English language speakers	590	530	18	45	36
Born outside Australia, English speaking	76	62	13	10	2
Born outside Australia, non-English-speaking	442	214	291	21	10

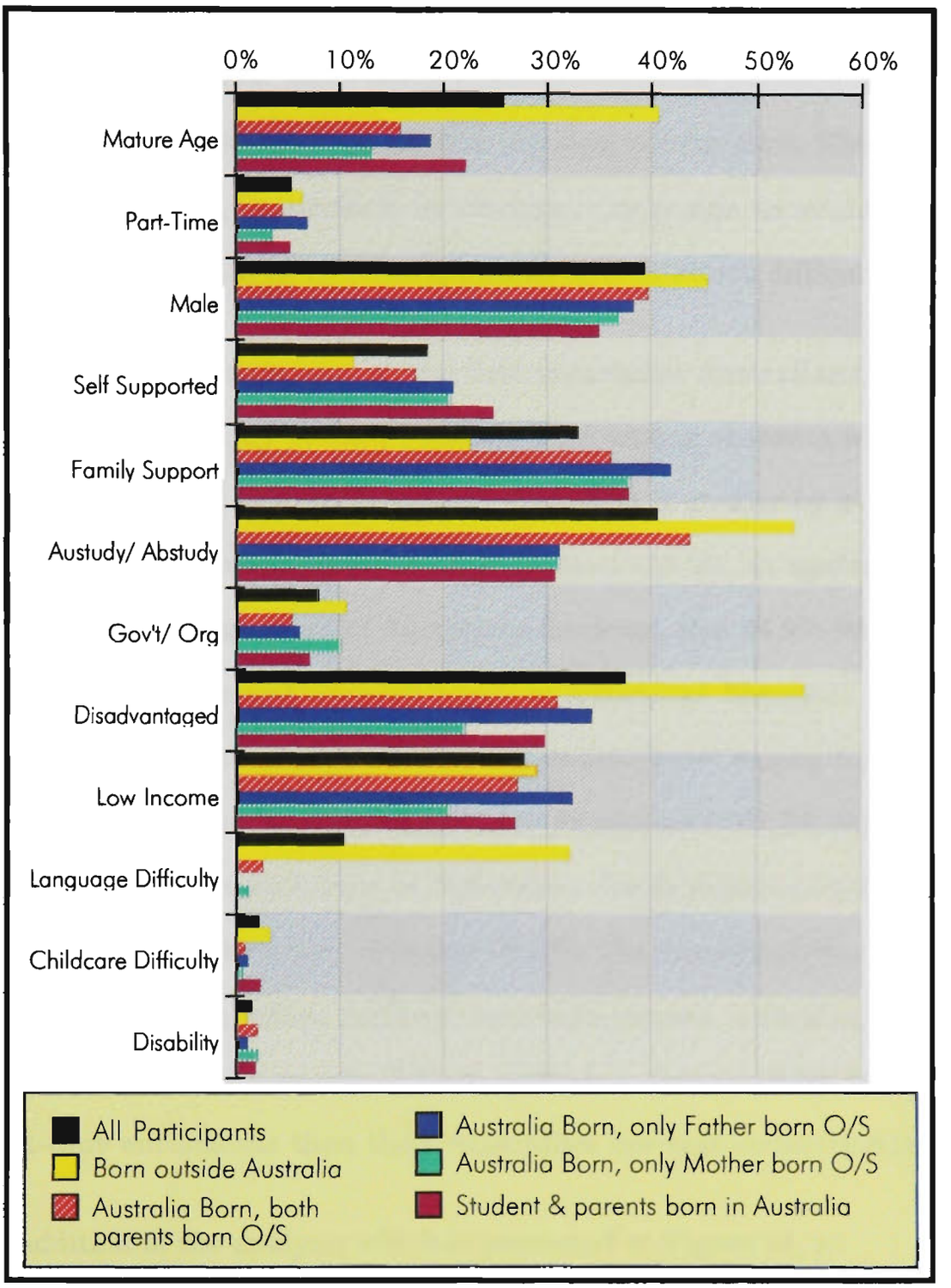
NB: Some students in the 'disadvantaged' column may be present in more than one of the four sub-categories (Income, Language, Childcare and Disability) which follow.

The next step in assessment of the dimensions of diversity within the group under scrutiny is to review the profile of the sub-groups in comparison to the total group.

For this purpose, the criteria of 'born overseas', '1st generation Australian' and 'language other than English spoken at home' have been dropped from the fifteen factors against which the total group has been profiled previously, so that sub-groups selected according to these criteria (as they appear at Figure 17 above) can be cross-tabulated against the remaining twelve factors.

The resulting data appear in Figure 19 and Figure 20 (above), and are presented in graph form at Figure 21 (below).

Figure 21. Profile of culture/language background of the participants.



NB: The number of students meeting each criterion is expressed as a percentage of the total number in the relevant sub-group for the purposes of the above chart.

By comparing the proportion of each sub category of students graphed at Figure 21 with the proportion of all participants against a given element, it is possible to determine the distinguishing characteristics of each sub-group.

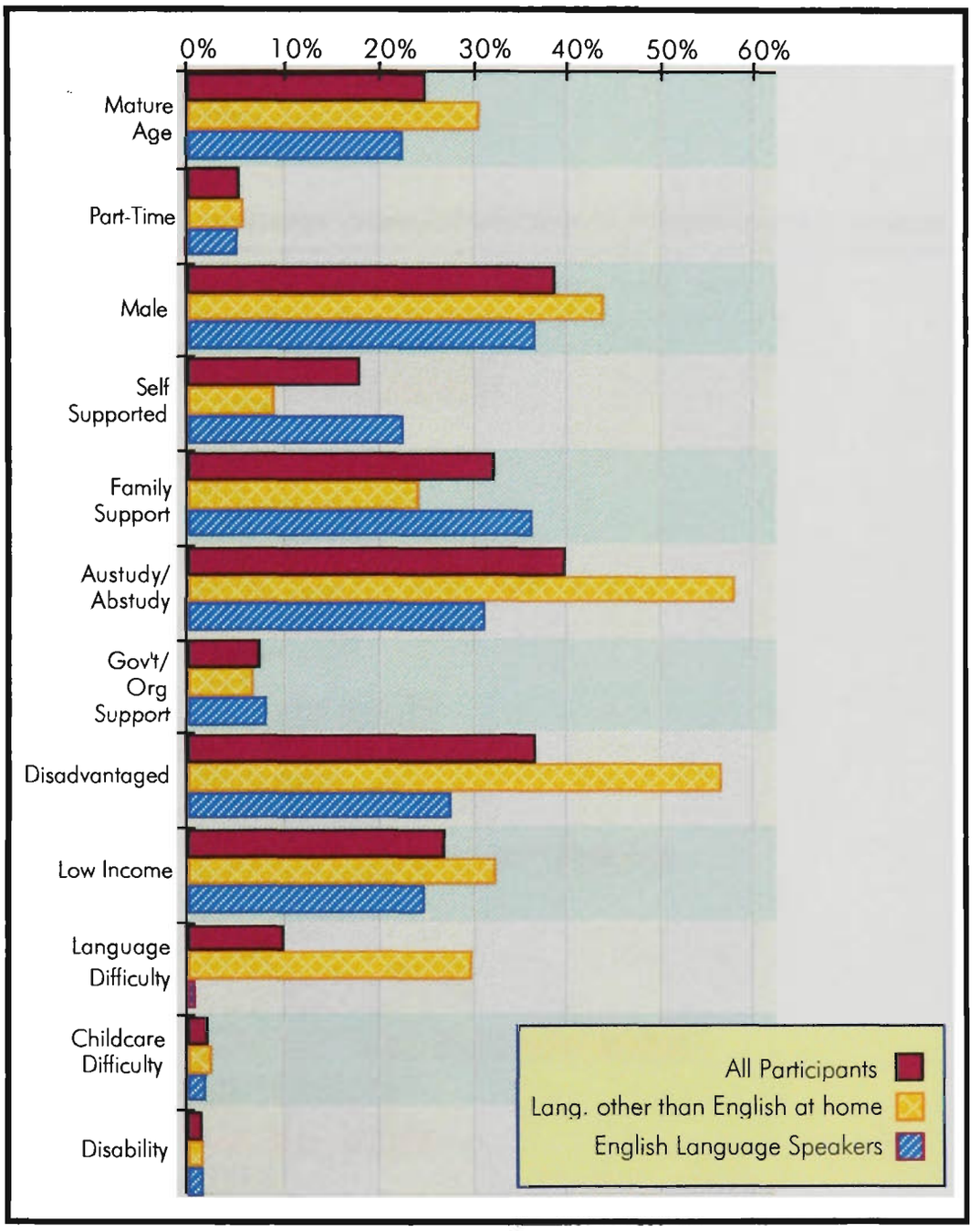
As can be observed, a greater proportion (than for the participants as a whole) of students born outside Australia are mature age students. Such students are far more likely to be dependent on Austudy, or other Government support, and they are significantly more likely to be disadvantaged, particularly in relation to language, as might be expected, as well as in relation to income and childcare difficulties.

Across all four groups of new and first generation Australians, there are a greater number of male students than among students whose parents were both born in Australia. This effect is greater by a margin of 7.0% among students born overseas (45.3%, as against 38.3% for second generation Australian students, and 34.9% for students whose parent were both born in Australia). Moreover, there are 1.4% more students enrolled on a part-time basis among those whose fathers were born overseas (6.8%, as against 5.4% for students whose parent were both born in Australia), closely followed by those who were themselves born overseas (6.4%). The remaining two groups – students whose mothers were born outside Australia, and those whose parents were both born overseas – accounted for fewer part-time enrolments than their Australian heritage counterparts.

In addition to the analysis which is presented at Figure 21, a comparison of those whose main language spoken at home is a language other then English, with those who spoke English at home at the time of enrolment has been undertaken. This is important in order to assess the relationship between perceived language difficulty and the home language environment, but also provides a counter-view of the relationship between language and cultural profiles,

when compared to the data on the sub-groups (above). Language data are provided in graphical form at Figures 22 and 23.

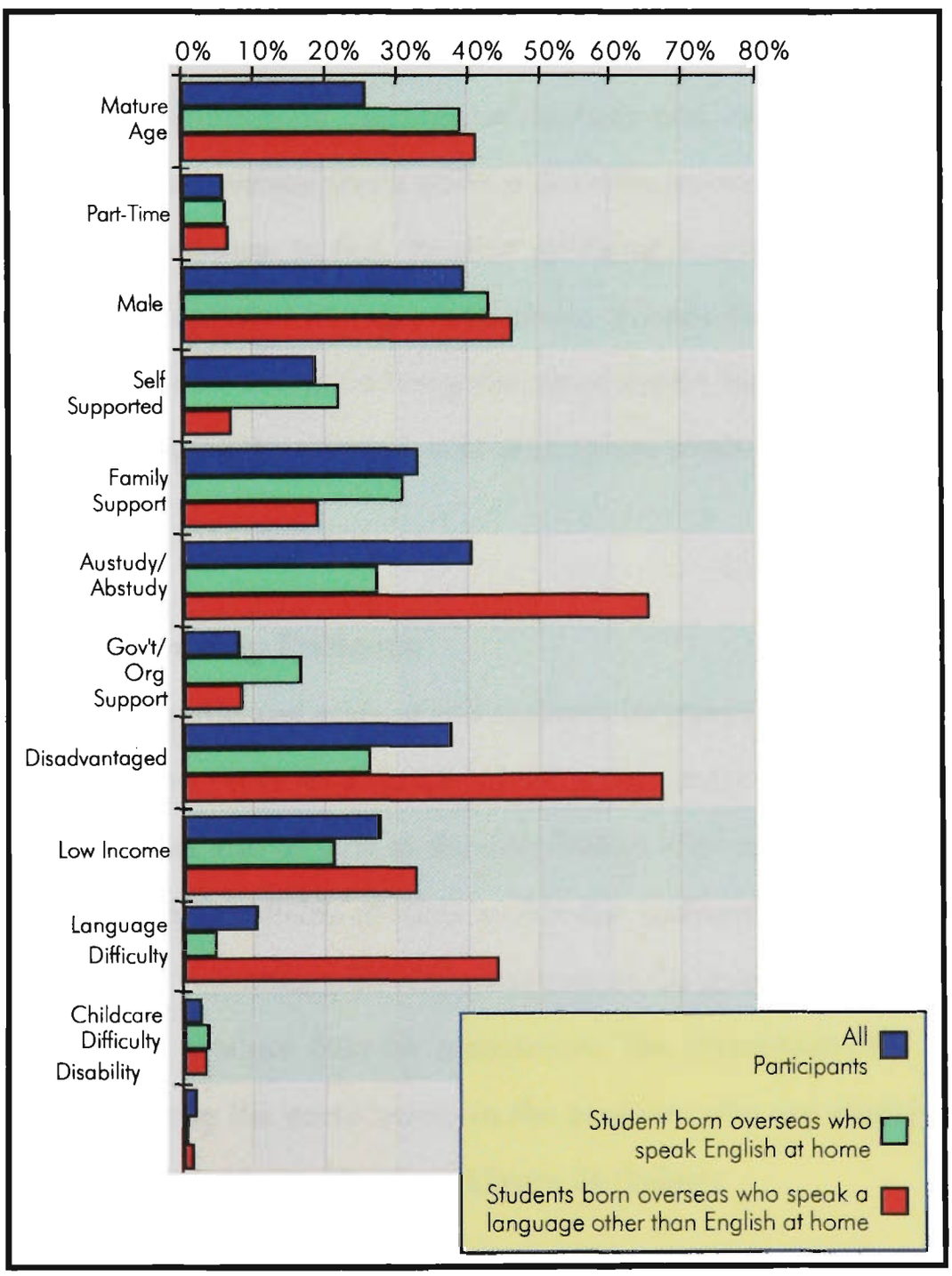
Figure 22. Profile of English language speakers against non-English speaking background students.



It can be seen at Figure 22 that there is a strong connection between perceived language disadvantage and language spoken at home, as expected. This is in keeping with the findings of a study of the perceptions of disadvantage of the cohorts being studied (Cologon, 1995a). It is, however, also apparent that the patterns which were

observed previously in relation to data on country of birth are repeated in relation to language data. Here again, among those students who speak a language other than English at home are more mature-age students, more part-time students, fewer female students, a larger proportion reliant on government allowances and support and higher levels of perceived disadvantage.

Figure 23. Language cross-tabulation, students born overseas.



The relationship between language and place of birth can be examined further if the group of students born outside Australia is divided into those who spoke English at home at the time of enrolment, and those who did not. This further analysis is possible from the chart which appears at Figure 23.

Here it can be seen that there is a sharp differentiation between two language categories within the sub-group of students who were born outside Australia; that is, on the criteria of the number of students who are self supporting, reliance on Austudy and income and language disadvantage there are marked differences between the two language categories. In fact, English speaking students are not greatly differentiated from the total group on most background factors, a notable exception being that they almost match the non-English group in the proportion of mature-age students among their ranks.

6.3 Noteworthy Patterns

Whilst the profile and scale of cultural and language diversity reported above provides a picture of the group under scrutiny, some attention must also be paid to the distribution of component groups among the various fields of study within the University. This has been done by repeating part of the analysis at the level of Faculty enrolment to produce data for comparison. The percentage of students among the participants in the program who are studying in each of the Faculties is shown at Figure 24 (below).

Figure 24. Distribution of sub-groups among faculties.

	Total Number	Arts	Business	Engin'ng	Human Dev't	Science
Born outside Australia	877	14.3%	32.3%	19.4%	15.2%	18.9%
Australia-Born, both parents born o/s	726	18.0%	34.8%	12.9%	16.5%	17.6%
Australia-Born, only Father born o/s	237	15.6%	28.7%	5.5%	37.1%	13.1%
Australia-Born, only Mother born o/s	135	13.3%	34.1%	11.1%	24.4%	17.0%
Student & parents born in Australia	1,111	14.2%	34.1%	5.0%	34.7%	11.9%
All Participants	3,086	15.2%	33.3%	11.3%	24.6%	15.6%

The data which have been reproduced above show that students within each of the sub-groups are distributed among the faculties in proportions which are comparable in most cases to the size of the total participating group in the faculty in question (which is in turn proportional to the size of the undergraduate intake in the respective faculty).

Notable exceptions to this pattern of distribution are that a substantially higher proportion of students born outside Australia are present in the Faculty of Engineering than in other Faculties (matched by a lower number of students born, and with both parents born, in Australia). A less marked variation of this type can also be observed in relation to the distribution of students between sub-groups in the Faculty of Science, whereas the reverse trend is present among the data from Faculty of Human Development.

It can also be demonstrated that the composition of the sub-groups within each Faculty reflects the diversity which characterises the group as a whole, with those countries of origin which are represented by significant numbers being approximately proportionally represented across the Faculties (again favouring Engineering and, to a lesser extent, Science at the expense of Human Development), though these trends are more marked among students born in some countries than others. Of these groups, the largest group is made up of students born in Vietnam, and it is in this group that the skewed distribution towards Engineering and Science is most marked.

6.4 Diversity in Relation to Aspirations

A further element of the data collected from students participating in the study relates to their motivation (their aspirations to achieve high grades in their studies). This was measured in a survey question by application of the principles for measurement of attitudes described by Henerson, Morris & Fitz-Gibbon (1987). The various facets of these data have been discussed in a recent paper (Cologon, 1995c), and will be described in detail in a subsequent chapter.

Suffice to say at this point that in the application of an index of motivation developed to facilitate comparisons between groups of students, it was ascertained that motivation is linked to age. In considering data on motivation in relation to sub-groups within this analysis, it is therefore important to consider the relationship between the mean ages of the sub groups and the motivation index.

The data on motivation, presented below at Figure 25, are therefore accompanied by age data.

Figure 25. Age and motivation data by language and birthplace sub-groups.

	No of Students	Mean Age	Motiv'n Index
Born outside Australia	877	22.1	35.1
Australia-Born, both parents born o/s	726	19.1	35.5
Australia-Born, only Father born o/s	237	19.3	34.3
Australia-Born, only Mother born o/s	135	19.1	32.9
Student & parents born in Australia	1,111	20.3	34.8
All Participants	3,086	20.4	34.9
Language other than English at home	999	20.6	34.8
English Language Speakers	2,087	20.3	35.0
Born outside Australia, English speaking	236	23.1	36.7
Born outside Australia, non-English-spkng	641	21.7	34.5

By reference to a table of motivation against age for the total group (see Chapter 8, Figure 44) it can be seen that a motivation index of 35.1 for the sub-group of students born outside Australia is consistent with the mean age of that group of 22.1 years. By contrast, the Australia-born, both parents born overseas sub-group has a lower mean age and a higher motivation index, showing a departure from the norm for this group. Similarly, the second last sub-group shown above, born outside Australia English speaking, shows a relatively high motivation index against mean age.

Consistent with previous studies, work reported in Chapter 8 points to a strong relationship between motivation and academic performance, so these data are an interesting precursor to an

examination of the study outcomes for language and culture sub-groups of the participating students.

6.5 The Impact of Culture and Language on Achievement

The next step, a review of the academic achievements of members of each of the sub-groups reviewed above, has been undertaken. The results appear at Figure 26. In early analysis of results, the success index was viewed in conjunction with both a weighted average mark and a progress ratio, in order to facilitate comparison with other studies, and also to provide background data as a point of reference for interpretation of the success index. All three sets of data are reported here for the same reasons.

Based on an assumed confidence level for raw data (students' numerical results) of greater than 95%, and bearing in mind the variable degrees of freedom associated with groups of different population size (as is the case with those represented at Figure 25), mean differences of less than 0.4% would be of doubtful significance. For the purposes of discussion, however, variations of 0.4% and greater have been deemed noteworthy.

It can be readily seen at Figure 26 that the success of students born in Australia is greater than that achieved by other groups. More marked, however, is the difference which attaches to language spoken at home and on closer examination, it can be seen that the group of students born outside Australia but who speak English at home have achieved marginally higher means than the aggregated results for all participants (although the standard deviations indicate

that there is more variability within this group than overall). It is therefore possible to conclude that the effects of language difficulties account for the greater part of the success differential which accompanies birthplace.

An interesting feature of the results of this analysis is that the two groups identified earlier as having higher than expected motivation when compared to their respective mean ages have not performed as expected. Whereas, as indicated previously, a link has been established between motivation and success (Cologon, 1995c) the sub group who were born in Australia of parents both born overseas showed highest motivation for age of the birthplace groupings, but produced the lowest success index and progress ratio outcomes, their aspirations thus exceeding their achievements. This might be accounted for, in part, by the high proportion of these students who speak a language other than English at home (49%) and also by the greater potential for cultural conflict and displacement which this situation engenders.

By contrast, the group who were born outside Australia, but speak English at home exhibit higher than usual motivation, but their achievement is closer to the overall group mean. This shortfall of achievement, however, is not great, and can readily be accounted for in terms of cultural tensions and adjustment periods, since this group includes significant numbers of recent immigrants and overseas students.

Figure 26. Academic performance of 1993 and 1994 participants by birthplace and language sub-groups.

	Progress Ratio	Std. Dev.	Mean W.A.M.	Std. Dev.	Success Index	Std. Dev.
Born outside Australia	75.7	30.98	57.4	14.32	47.6	24.24
Australia-Born, both parents born o/s	74.0	30.90	55.9	13.78	47.5	23.91
Australia-Born, only Father born o/s	80.1	28.56	59.4	13.31	52.0	23.58
Australia-Born, only Mother born o/s	78.9	30.63	57.8	13.98	52.4	23.94
Student & parents born in Australia	84.9	25.31	61.6	12.65	56.6	22.19
All Participants	79.1	29.21	58.7	13.72	51.3	23.75
Language other than English at home	73.0	31.51	55.5	13.99	45.0	23.85
English Language Speakers	82.0	27.56	60.3	13.32	54.4	23.10
Born outside Australia, English speaking	81.9	27.87	60.5	14.26	53.6	23.44
Born outside Aust., non-English-Spkng	73.5	31.75	56.2	14.17	45.4	24.16

6.6 Adjustment Factors

Conventional wisdom in relation to the difficulties in dealing with cultural dislocation suggests that those who venture forth in the company of others of similar background may find adjustment easier, and may in fact provide support for each other. The data available to this study provide an opportunity to test this maxim. As indicated earlier, there are many countries represented among the birthplaces listed by participating students, of which only a few account for significant numbers of students. Therefore the group of students born outside Australia can be readily separated into two

groups: those who belong to a body of students (say thirty or more) from a particular country, and those who come from a country represented in smaller numbers and who are therefore less likely to find themselves members of a support group or enclave within their course, faculty or campus.

To achieve the division into groups from well represented countries and less well represented countries, those countries which have over thirty expatriate students among students participating in the study have been identified. Although this group represents almost half of the participants who were born outside Australia, it is comprised of only four country categories. These four countries represent a wide range in terms of language, culture and geographic distribution, each falling within a different region in the groupings cited previously (see Figure 18). To divide the remaining participants born outside Australia into two approximately equal groups, a further eleven country categories which are represented by between thirteen and thirty students each have been drawn out to form the second group. The second group is of similar diversity to the first, with seven of the regions charted at Figure 18 being represented among the eleven countries. The third group is made up of the remaining sixty-eight country categories, each containing twelve or less students. Data showing the academic achievement indices for each of the groups, tabulated against the performance of the sub-group of students born outside Australia as a whole are presented at Figure 27.

In this instance, since the success index incorporates a factoring procedure based on the grade aims of participants (as measured by the survey) and since the motivation index, also derived from the same survey answers is under review, progress ratios and weighted average marks have again been provided as a comparative reference.

Figure 27. Academic performance by country-of-birth groupings according to the numbers of students from the same country among the participants.

	No of Students	Mean Age	Motiv'n Index	Progress Ratio	Std Dev	Mean Score	Std Dev	Success Index	Std Dev
A	3,086	20.4	34.9	79.1	29.21	58.7	13.72	51.3	23.75
B	877	22.1	35.1	75.7	30.98	57.4	14.32	47.6	24.24
C	390	21.6	33.9	73.4	30.97	56.5	14.13	47.0	23.97
D	213	23.1	35.9	77.6	30.17	57.4	14.31	47.6	23.95
E	274	21.9	36.2	77.7	31.38	58.7	14.50	48.4	24.81

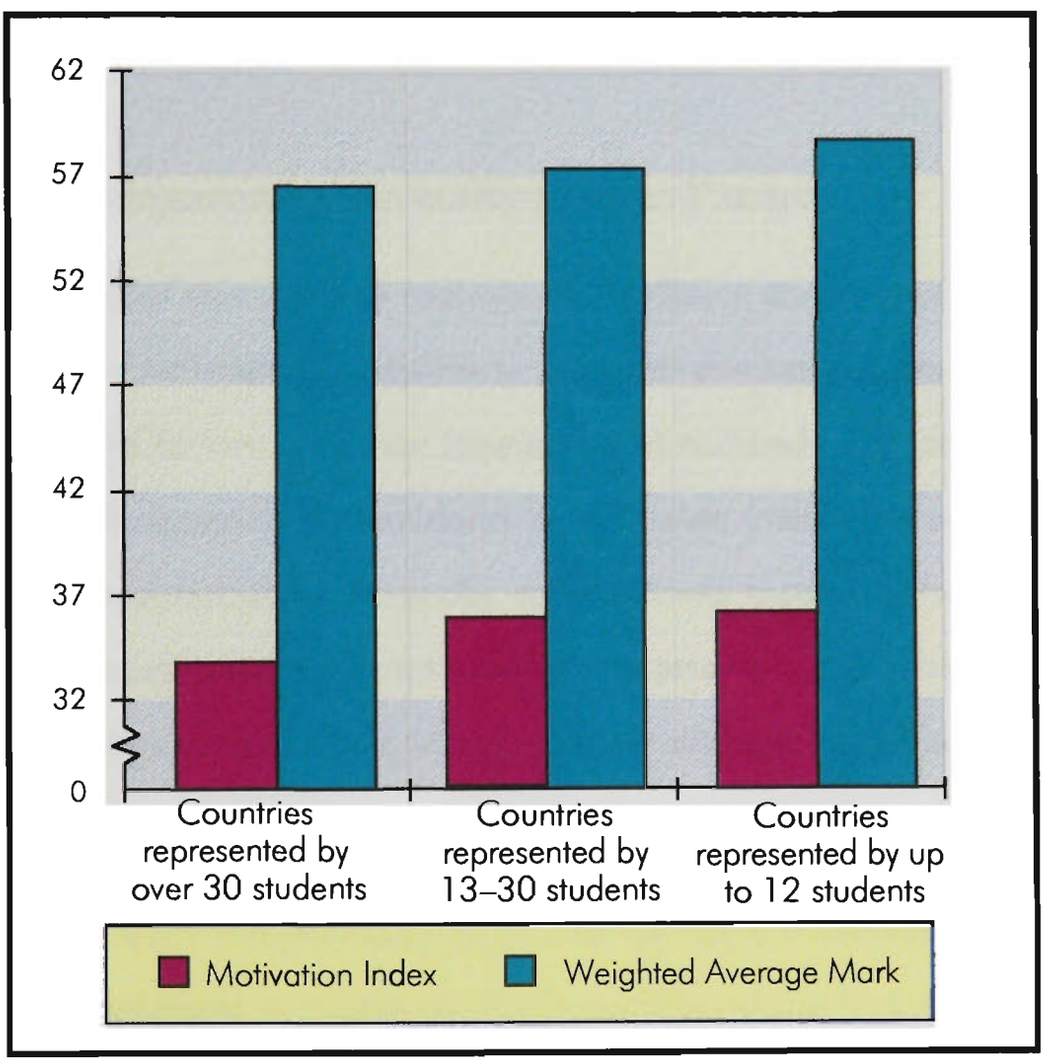
KEY:–
A: All Participants
B: Born outside Australia
C: Countries represented by over 30 students
D: Countries represented by 13-30 students
E: Countries represented by up to 12 students

It is clear that academic performance is not enhanced by being a member of a cohort of expatriate students, and that, based on the three groupings identified above, a clear trend emerges: the fewer your compatriots within the University, the higher your motivation to succeed is likely to be, and the greater your probability of success. This is thought provoking, and suggests that, in some respects, cultural adjustment may be inhibited by the presence of others who

may act to sustain the previous culture in ways which may have the effect of perpetuating or exaggerating the experience of cultural tension.

By way of illustration, motivation and weighted average mark data drawn from Figure 27 are depicted graphically at Figure 28.

Figure 28. Detail of graph showing inverse relationship between size of cohort and academic performance of expatriates.



NB: The weighted average mark has been chosen for use in this graph rather than the success index because the latter incorporates an adjustment for motivation, rendering such a comparison recursive.

Whilst this result may not be conclusive, it does point to a potentially important relationship which should be considered in relation to the position of culturally alienated or minority groups generally and, as

is shown at Figure 28, represents a marked increase in motivation and statistically significant (>0.4) improvement in academic performance among the members of smaller cohorts of immigrant and onshore overseas students.

The relationship between performance and cohort size appears to operate independent of faculty or mean age, language or cultural origin (the results achieved by a mix of students from third world and developed countries being comparable to those reported above).

6.7 Management of Diversity and the Future

The results of this analysis indicate that cultural diversity presents particular challenges in relation to academic success and that this is represented by two concerns; language and cultural displacement. Whilst it is apparent that students born outside Australia and first generation Australians generally achieve lower mean results and pass fewer subjects (achieve a lower mean progress ratio) than the group means, a substantial portion of these difficulties can be attributed to language.

While the work reported here did not reveal marked differences between outcomes or factors at play in relation to particular cultural groups, it is suggested that there would be benefit from a more detailed study in this area. For example, one might expect that some groups may be advantaged rather than disadvantaged by cultural factors, if not in general then within certain disciplines. Such an investigation is, however, beyond the ambit of this program.

Although further research on the relationship between language support and achievement appears warranted, the findings of this analysis indicate that consideration should be given to provision of additional language support for students from non-English speaking backgrounds. In light of these findings it seems reasonable to infer that language difficulties are the most significant barrier to success for students from non-Australian cultural backgrounds.

Beyond the provision of additional language support, further attention might also be given to syllabus design to ensure that the curriculum is as accessible as possible to students with language difficulties, to method(s) of delivery to maximise opportunities for students to acquire vocabulary in class (rather than becoming a language casualty in the normal learning situation), as well as the extension of formal and informal extra-curricular support and language assistance.

Quite apart from the provision of additional or special support, there is the question of the appropriateness of curriculum and delivery to diverse groups; with this in mind, alternative teaching/learning strategies for higher education, such as those discussed by Trigwell and Prosser (1991) and Terry (1995), are helpful and could be reconsidered in relation to the results reported herein.

Finally, the question of cultural adjustment warrants further consideration in light of the findings reported above in relation to cohort size. Whilst a further examination of the circumstances under which various groups of students live and study, and the relationship

between those factors and their motivation and success would be helpful, it seems likely that students in their first year of undergraduate study do not benefit from the presence of others of like cultural origin.

An alternative view would be that students who are not able to rely on compatriots for support are more likely to form friendships or seek assistance from Australians, and may benefit from this contact in relation to their adjustment to the culture generally and to the requirements of university study. Either view of the circumstances might adequately explain the differences in motivation and success for these groups.

Whatever the causes of the performance differential among large and small groups of students from other cultures, it is reasonable to suppose that anything that universities can do to maximise the interaction between students born outside Australia and Australian students, and to minimise their dependence on fellow aliens would be likely to be of benefit. It is suggested that support structures for overseas students, and also for immigrant students, should be considered in these terms.

Within this chapter, the more detailed overview of the backgrounds of participants has led directly to the commencement of analysis of aspects of the data, and enrolment, statistical, results and survey data have for the first time been brought together. This forms the first part of what have been termed the parallel explorations (ref. Preface,

Figure (i)) which served to provide the groundwork for the primary analysis which was to follow.

Within the next section, a further three chapters are provided, each of which deals with a further phase of the parallel explorations. Within this section of the thesis and the next, each chapter draws on the understanding of the data gleaned from the previous analyses and, in turn, provides underpinning data and formative insights for the next.

SECTION FOUR: Explorations of the Data

Chapter 7:

Student Perceptions of Disadvantage

Chapter 6 reported the first stage of a general review and analysis of the data collected from all the sources outlined in Chapters 3 and 4. In the process of building an understanding of the data, from which to move to their interpretation and final incorporation into the experimental matrices, a number of more specific explorations have been undertaken relating to aspects of the data which are central to the purposes of the program. The account of these explorations within the three chapters which comprise this section is pivotal to comprehension of the path the program has taken and the discussion which follows.

In Chapter 3 it was explained that a question relating to perceived disadvantage was among those which commencing students were required to complete at enrolment for 1993. The data yielded by the question in 1993 appeared likely to prove useful for the program, and some preliminary analyses of the data it yielded in 1993 were commenced at that time. It transpired, however, that the University (for its own purposes) did not collect the same information in 1994. Although related information was collected at enrolment in 1994, it was not collected in the same way, and the data yielded were not comparable to those which had been available the preceding year.

Mindful of the fact that any attempt to collect comparable data via an alternative means was fraught with uncertainty, it was nevertheless decided to include a question based on that which had been on the enrolment form in 1993 (but omitted in 1994), at the end of the program survey mailed to the 1994 target group. There were two concerns attendant upon this decision: that students completing the question in different circumstances and/or at a different time of year might answer differently and that the presence of the question might in some way alter the response to the other questions on the survey.

In an effort to minimise the potential for the additional question to have impact on the answers respondents might give to the other questions on the survey, the extra question was placed last. In the event, no systematic variations in the patterns of responses to the original six questions in each year were observed. However the response rate in 1994 was not quite as high as the 1993 rate (see Figures 5 and 6 in Chapter 5), and one might attribute the reduction in the response rate between the two years to the presence of an additional question on the 1994 survey, which could have negatively influenced some students' decisions whether to respond.

7.1 The Significance of Context

Immediately upon receipt of the first returns of questionnaire data from the second cohort of students, it became apparent that the pattern of responses on the self-assessment of disadvantage question would vary widely from those which had been collected at enrolment from the preceding cohort. This pattern was confirmed with the

return of the remaining responses, and the differences are bold and stark. An overview of the responses appears at Figure 29 (below).

Figure 29. Aggregate data on self-assessment of disadvantage from program participants in both 1993 and 1994.

	1993 responses	%	1994 responses	%	Comparison; '94 to '93 (Δ%)
Nil Disadvantage Reported	1321	85.5%	626	39.9%	-45.7%
Any Disadvantage Reported	224	14.5%	945	60.2%	45.7%
Childcare Problems	16	1.04%	55	3.5%	2.5%
English Language Difficulties	90	5.8%	236	15.0%	9.2%
Low Income/ FinancialDifficulties	127	8.2%	735	46.8%	38.6%
Physical Disability	9	0.6%	45	2.9%	2.3%
TOTALS	1545		1571		

NB: some respondents indicated more than one type of disadvantage, and may therefore be counted more than once in the sub-categories above.

Most surprising, the total number of respondents indicating disadvantage increased from approximately 15% to over 60%, with a significantly greater number of respondents (650% increase in 1994) indicating more than one type of disadvantage. The variations in responses to each of the four indicators taken alone are no less astonishing, each having increased by a different margin, with almost half the 1994 cohort indicating, as the end of the first half-year of their studies approached, that their studies were being, or would be, hampered by financial difficulties. This compares with less than one tenth of the new entrants among the 1993 cohort, whose answers

were given at the time of their enrolment, prior to commencing studies.

Clearly, the variation between response patterns on this question warrants consideration and demands explanation. Logically, there are only two explanations possible: either the two cohorts were very different in composition, or the question (or the context in which it was asked, since the questions posed were almost identical) elicited significantly different reactions from the groups, and thereby skewed the responses.

The profiles of the two groups when the mix of disciplines is compared matches closely, and the geographic distribution of postcodes, prior to admission, shows little to differentiate them. Comparisons of the basis of admission, background and socio-economic data on the two cohorts of entrants, discussed in Chapter 5, revealed that the variations, including on nine indicators for which common information was available, showed only slight differences between the profiles of the two groups (ref. Figures 8 and 12), none of which could account for differences of the order of magnitude which occurred.

Since there is nothing which points to the composition of the cohorts being significantly different, the difference in the response patterns to the four part question about disadvantage must be attributed to the context within which the question was asked. There are several aspects of the context which could be assumed to have contributed to this effect.

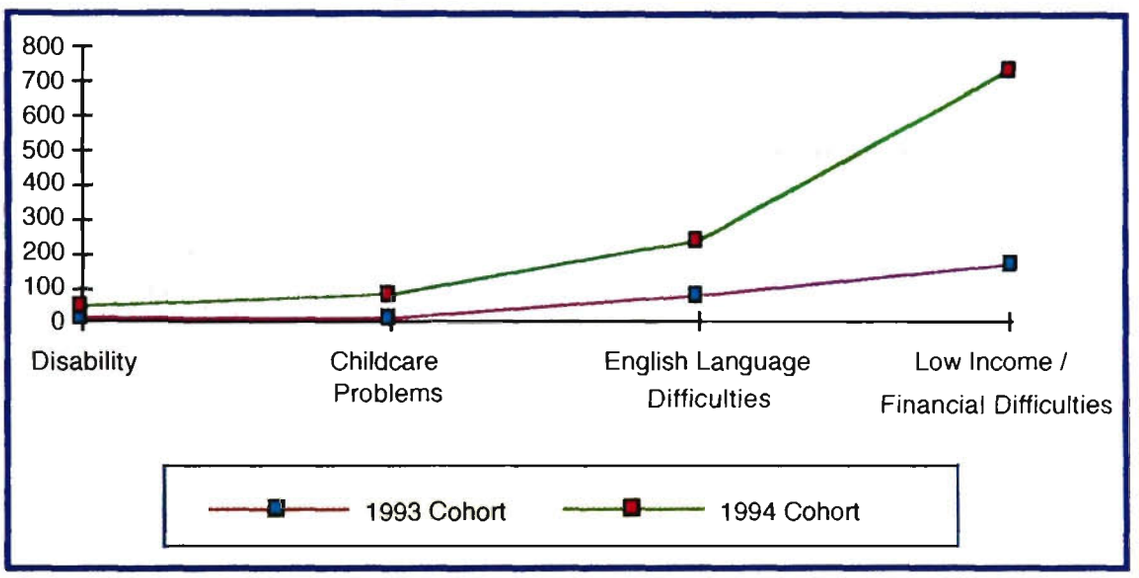
Firstly, the question was posed to the 1994 cohort after students had commenced studies and were approaching their semester one examinations, whereas the 1993 cohort had furnished answers to the question before commencing their first year studies. In the case of the 1994 respondents, an improved ability to evaluate the effect of personal hardships on their studies, perhaps amplified by a touch of exam anxiety, would go part of the way towards accounting for the increased indications of disadvantage among their survey responses.

Secondly, in 1994 the question was put as part of a brief questionnaire (rather than being part of the much more extensive data collection which takes place at enrolment), and was completed by the respondents in their own time, on their own terms. It is likely that respondents to the survey question were enabled to reflect at greater length before answering the question, and were less troubled by the bustle and urgency of enrolment (not to mention the other concerns and imperatives of enrolment) which would have prevailed when the 1993 cohort determined their answers to a similar question.

Finally, the survey returns (which were the conduit for collection of this information in 1994 but not in 1993) promised a degree of anonymity and were answered in the expectation that the data would not be available to anyone outside the program, whereas students might well infer that enrolment records would be more likely to be viewed by others with whom the student would have contact during her/his studies. It is, therefore, likely that some survey respondents responded less guardedly in 1994 than their predecessors did at enrolment sessions the year before.

It is interesting to note that although the number of respondents to each of the parts of the question increased dramatically, they retained their order of frequency and followed a more or less uniform geometric expansion between the two cohorts, as illustrated by Figure 30. Nevertheless, the importance of this contextual effect cannot be underestimated, as the interpretation of either result without reference to the context in which the question was asked and answered could be in jeopardy. The experience acts as a stark reminder of the perils of data collection.

Figure 30. Chart comparing responses to the self-assessment of disadvantage question in 1993 with those in 1994.



Since these results were achieved, information has become available about an investigation, recently commenced by colleagues at Victoria University of Technology, into the effects of timing on response patterns to questions such as those asked of participants in this program, about goals, motivation and disadvantage. In light of the experiences recounted above, the investigation may be viewed as one likely to provide important tools for those wishing to embark on more

thoroughgoing collection of self-assessment data in this area. The results are awaited with interest.

7.2 Evaluation of Self-Assessment

Whereas participants in this program in both 1993 and 1994 were invited to indicate perceived disadvantage (albeit in different contexts), it was also possible to infer disadvantage in a more conventional fashion from other data available on both the cohorts of respondents in respect of at least two of the indicators used. It has been observed that in the minefield of program evaluation, any opportunity to check or cross-tabulate data against externally verifiable sources should not be lost (Abbot-Chapman, 1993), as it can contribute significantly to the robustness of the results.

The two indicators against which independently collected data are available are financial difficulties, where data on the means of financial support have been collected separately; and English Language difficulties, where language background and competency data are available. This second perspective on the interpretation of self-assessment data is a further step towards giving context and meaning to subjective data.

On examining the data on financial disadvantage (summarised at Figure 31), it can be seen that a greater proportion of students who had indicated they would be dependent on AUSTUDY and ABSTUDY allowances as their main source of financial support reported that financial difficulties may influence their studies.

Figure 31. Disaggregation of the financial status data cross-tabulated against self-assessment of financial disadvantage.

	Austudy/ Abstudy	Family Support	Sponsor-ship	Self Support	Other
% Claiming Disadvantage '93	70.6%	10.3%	0.0%	17.0%	2.1%
% Not Claiming Disadvantage '93	38.9%	38.7%	0.9%	20.3%	1.3%
% Claiming Disadvantage '94	53.5%	27.9%	0.2%	17.4%	1.0%
% Not Claiming Disadvantage '94	39.5%	37.7%	0.4%	21.6%	0.9%
% Claiming Disadvantage (all)	58.4%	22.9%	0.2%	17.3%	1.3%
% Not Claiming Disadvantage (all)	39.0%	38.5%	0.8%	20.5%	1.2%

This information can be more readily understood when graphed as at Figures 32 and 33. It can be seen that the proportions of respondents reporting financial disadvantage, from among those whose main source of financial support was sponsorship, savings or personal income or other, were comparable. This is reasonable, given that a range of income levels is possible within each of these groups. The first two categories of financial status data, however, show a marked difference (35.5% of respondents – a 250% increase) in the proportion of respondents claiming financial disadvantage. Again, this is explicable, since most students in both categories are receiving an allowance (AUSTUDY or ABSTUDY), but those in the first category are reliant on that allowance as their main source of financial support, whereas the second group saw the allowance as secondary, and financial assistance from their families was their main support.

Figure 32. Graphical overview of cross-tabulated disadvantage data: financial status against financial disadvantage (all participants).

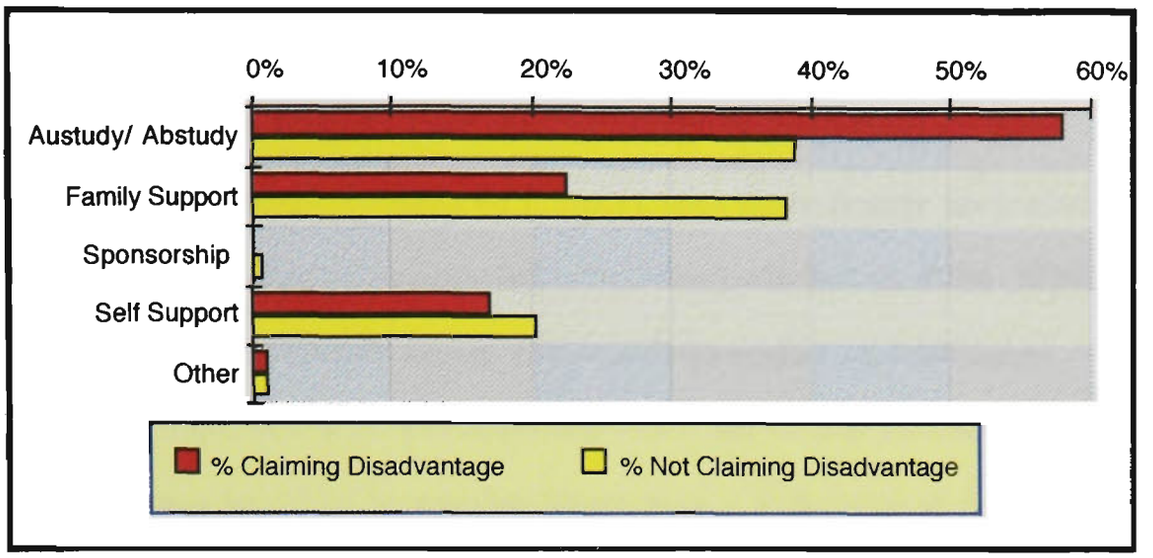
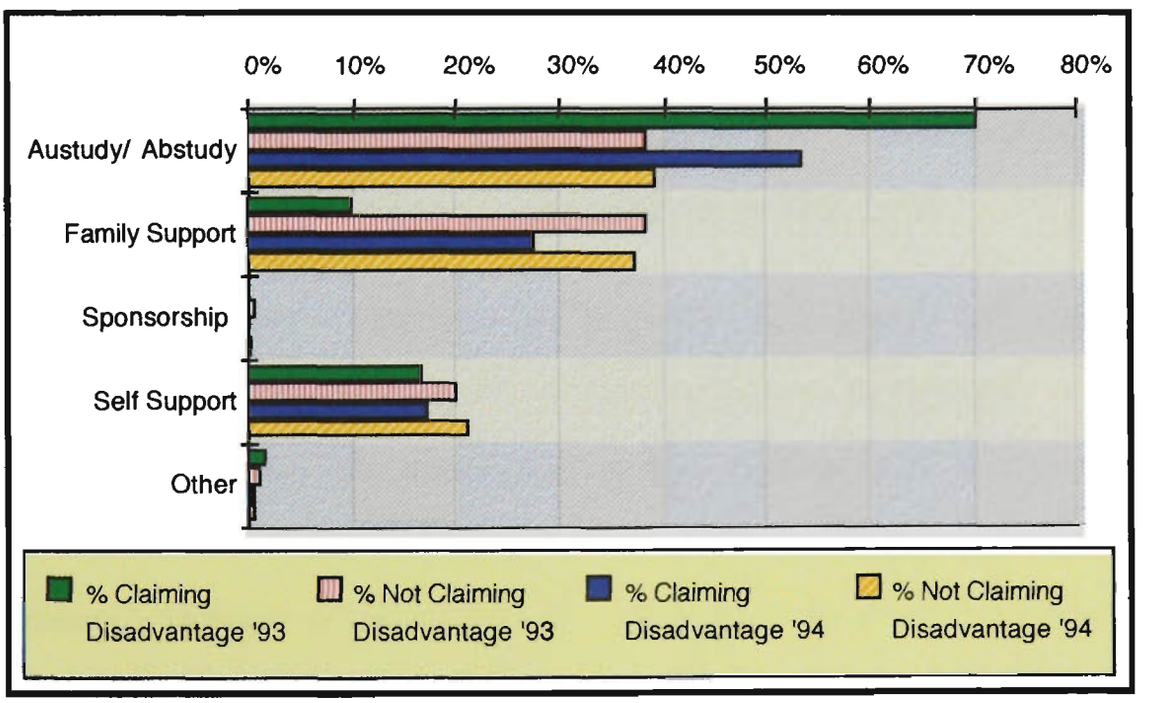


Figure 33. Graphical view of cross-tabulation of financial disadvantage data showing the 1993 and 1994 cohorts separately.



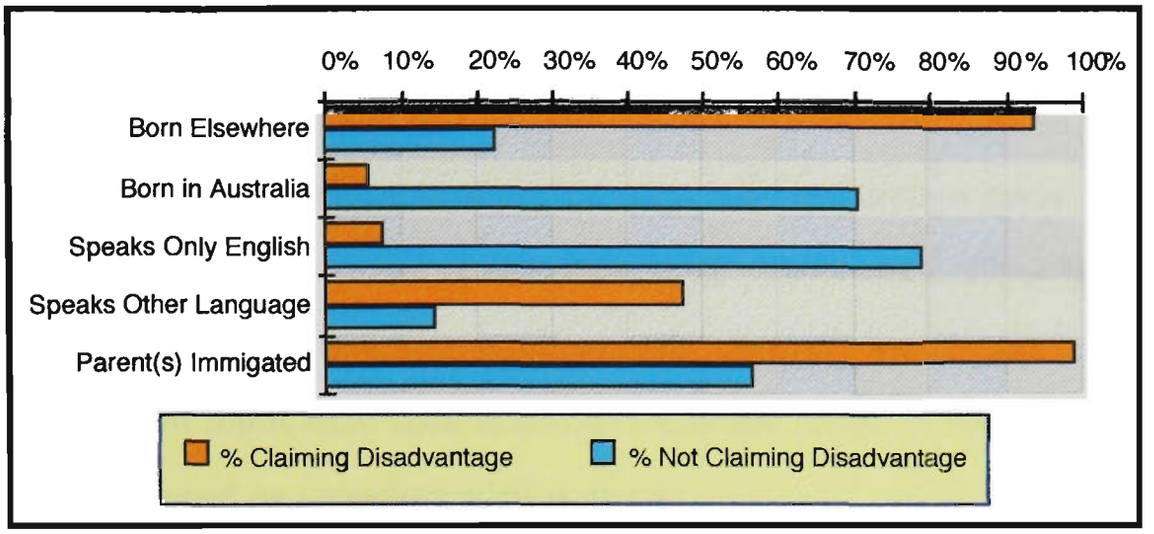
In order to assess the consistency of this effect between the two sets of data, remembering that it was earlier concluded that three contextual factors (timing, surroundings and anonymity) were potentially influential in amplifying the response rates of the second cohort, Figure 33 expands the data set presented at Figure 32, to show

the 1993 and 1994 cohorts of respondents separately. Here it can be observed that the same trends exist, but that the difference between the first and second groups is more pronounced in the responses from the 1993 cohort. Put differently, a higher proportion of those whose main source of financial support was their family indicated that financial difficulties may influence their studies in 1994. Whilst not negating the overall trend, this result provides an additional question about context. Although the financial status profiles of both cohorts were found to be similar, there was a difference of 5.8% in relation to family support (ie 5.8% less students indicated that their families were their main source of financial support in 1994 than in 1993). In light of this, there is some question as to whether shifts in national economic circumstances and an upward employment market trend (during 1993) might account, in part, for the variation in response patterns visible on this indicator at Figure 33.

After undertaking a similar cross-tabulation of language difficulties self-assessment responses with enrolment data on birthplace, parents' birthplace and language(s) spoken at home (see Figure 34 for a graph of summary data), an even greater consistency can be observed. In light of this, the contextual robustness of the responses can be seen to be greater than for the responses on self-assessment of financial disadvantage.

These data support the idea that self-assessment methodology is a means of extending our understanding of the impact of individual circumstances on outcomes.

Figure 34. Language background profiles charted against perceived language difficulty.



One might suppose that self-assessment data provide a richer base of predictive information than data extrapolated from cultural and socio-economic profiling, such as those presented above. However, unless actual outcomes can be evaluated and linked to self-assessment data and profile data for the purposes of comparison, the value of either type of data remains uncertain.

7.3 Reality Testing Students' Perceptions

In a previous chapter, in reviewing approaches to the definition and measurement of success, it was observed that an extreme view at one end of the spectrum could be characterised as saying that a student is successful if he/she makes her/himself happy. One might place equal importance upon students' perceptions concerning the reasons for their relative achievements.

The act of putting students' perceptions to the test is, however, of more than passing interest for this program. Since the methodology relies, in part, upon students' own evaluations in the form of their answers to attitudinal measurement instruments included in the

surveys they completed, the accuracy of their perceptions (and, for that matter, their reporting of them) is a question of central importance.

The definition of success is of pivotal importance to this program. After considering a range of competing and sometimes conflicting approaches to measurement in Chapter 2, a broadly based model drawing on input from both examiners and the students themselves, was developed as described in Chapter 3.

Having recovered, however, from the dizzy spells brought on by the success debate and thinking one knows what success is, one then arrives at the elephant traps; the questions about what causes success. Does a student who suffers disadvantage perform less well because of that disadvantage, or if the student performs well is that an indication that only highly competent students could survive the disadvantageous conditions (either having been self-selected out, not admitted, or having been admitted and become a casualty before examination)? If students expend greater effort in the face of adversity, then their results may match those of other students, yet their disadvantage is no less real. It is at this point that the debate is in danger of becoming recursive.

The only way around the elephant trap is to draw back for a moment and consider the purpose of such an investigation. There are two good reasons why we might collect data on disadvantage other than to report them to external funding bodies for a few brownie points and publish them in institutional annual reports. The first purpose is to ensure that recruitment and selection strategies are working: that

we are not excluding applicants who would succeed, that we are not "setting people up to fail" by admitting them without providing, perhaps without being able to provide, an environment in which they can succeed. The second reason is that we may then better understand what adjustments can be made to address difficulties which impede success, and can allocate resources and provide support in ways which make access objectives more than rhetoric, and provide the substance behind open admission policies.

Having revisited our purpose it is possible to conclude that if students who are identified as disadvantaged, or who perceive themselves as disadvantaged, are doing well alongside other groups, this does not necessarily negate the data. Rather, it can be viewed as evidence that support structures are adequate for the demands placed on them by current admission policies. In this case, moves towards more open policies should be entertained. Alternatively, if perceived disadvantage is followed by reduced academic success, then the flexibility of our admission policies is not adequately matched by the programs of support within the University or within the community.

7.4 The Matching of Data and Results

Utilising the database designed for the program, which enables simultaneous interrogation of the full range of data collected from all sources – enrolment files, survey returns and academic results released to the program by participating students – it has been possible to cross-match the success indices with input data about students' perceived disadvantage. Compact summary data drawn

from cross-matching procedures have been collected and presented for the purposes of this exploration.

The first data set which has been prepared compares the outcomes (again providing, for reference purposes, a progress ratio as well as the success index) for those participants who indicated perceived disadvantage with the outcomes for those who did not. The outcomes are provided for these sub groups within each of the cohorts separately, and then combined. For reference purposes, the outcomes for each cohort as a whole and for the participants taken as a whole are also provided. These data are arranged into a table which appears at Figure 35 (below) and illustrated by the graph which may be found at Figure 36.

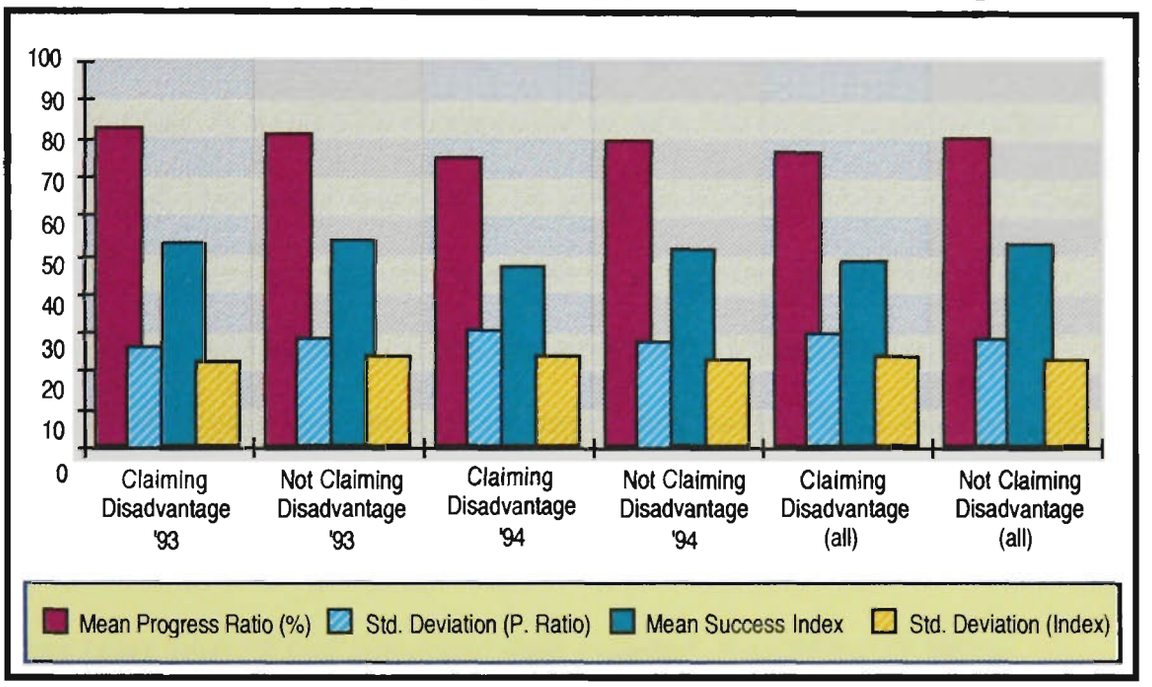
Figure 35. Table of student progression and success indicators comparing groups citing perceived disadvantage.

	Number of Students	Mean Progress Ratio (%)	Std. Deviation (P. Ratio)	Mean Success Index	Std. Deviation (Index)
Claiming Disadvantage '93	222	82.3	26.74	53.1	22.69
Not Claiming Disadvantage '93	1,308	80.8	28.54	53.8	23.52
Claiming Disadvantage '94	938	75.4	30.86	47.0	24.15
Not Claiming Disadvantage '94	618	79.8	28.34	52.0	23.09
Claiming Disadvantage	1,160	76.8	30.24	48.2	23.99
Not Claiming Disadvantage	1,926	80.5	28.48	53.2	23.40
Overall, 1993 Cohort	1,530	81.0	28.39	53.7	23.40
Overall, 1994 Cohort	1,556	77.2	29.96	49.0	23.85
Overall (both cohorts)	3,086	79.1	29.21	51.3	23.75

A close look at the aggregated summary data on progression (progress ratio) and academic performance (success index) which are presented at Figure 35 and depicted at Figure 36 highlights the fact that the meaning of student perceptions collected at enrolment in

1993 was not the same as that of the data collected in 1994 by survey during semester one. Before saying "this was to be expected", one should stop and consider what has occurred: those among the 1993 cohort who identified themselves as disadvantaged prior to commencing studies were able to achieve a success index comparable to that attained by those not indicating disadvantage, with their mean progress ratio in fact being better than the cohort overall.

Figure 36. Graphical overview of success and progress indicators comparing groups citing perceived disadvantage.



The unexpectedly high overall performance of the 1993 disadvantage group cannot be attributed to their having expressed low goals (which could cause up-scaling of the index) because their mean weighted average mark, like the mean progress ratio, exceeds the mean for the cohort. In fact, on checking, it was ascertained by reference to the original data that the group expressed higher progression goals, and that this resulted in a marginal down-scaling of their mean success indices relative to the rest of their cohort. Equally important, the

range of scores which lies behind the group means presented here, as represented by the standard deviations provided, falls within the span of the results of the total group (although the differences in span are of no greater magnitude than the variations between means).

As observed earlier, the fact that, overall, these students performed as well or better than others, does not necessarily signify that the data on their disadvantage were inaccurate, or that self-assessment does not produce useful information, but may point to other factors influencing the outcomes.

In this case, it would be reasonable to assume that students who recognised that they were at risk prior to commencing studies sought to avail themselves of opportunities to overcome the difficulties they perceived. Such opportunities are provided at the University in a variety of forms, but are not a compulsory part of first year programs. The effect of this is that only those students who have identified their own needs are likely to take advantage of remedial options. It is likely that after part of the semester had elapsed, a number of these students who had engaged with strategies which worked to improve their academic competitiveness, would have ceased to identify themselves as disadvantaged. It is equally likely that others, armed with the experience of weeks of struggle against obstacles arising from their circumstances, would have concluded that they were at a disadvantage, where previously they thought themselves well placed. These students would have missed opportunities to involve themselves in various activities or programs which might address

the problems which hampered them. Their results illustrate this misfortune.

The differences between the performance of students perceiving themselves as disadvantaged in the 1993 and 1994 cohorts, when viewed in light of the context in which the information was collected, stand testament to the dual operation of hindsight. One might conclude that support programs for disadvantaged first year students were both adequate and successful within the limitations of *students' own awareness* of the need to act.

Needless to say, the data presented above deal with generalities, and a quick look at the standard deviations provided confirms that the results achieved by individuals cover a broad range and a proportion of the individuals were unable to overcome the difficulties which faced them. However, the purpose of this analysis was not so much to understand individual experience as to identify trends and general principles.

Having considered summary data relating to the group of students who perceived themselves to be disadvantaged, it is useful to view data on each of the four types of disadvantage experienced by members of the group.

The data on these sub-groups are presented in table format at Figure 37, below. In viewing these data, it should be borne in mind that the numbers of students in several of these sub-groups are small, and one consequence of this is that an outstandingly high or low performance by a small number of students in a group of this size

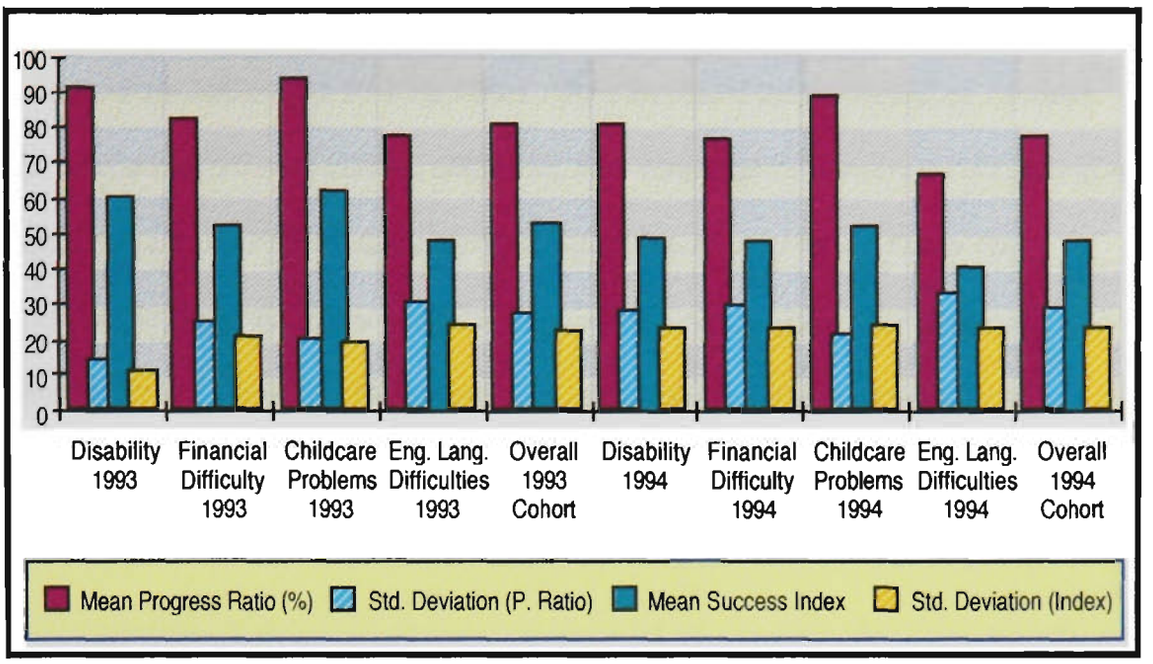
can have a significant effect on the overall group performance (in statistical terms, estimates of significance vary between the groups). Nevertheless, all the data have been included, as they are of greater value and interest as a complete set, and serve to illustrate the consistency of the results both within and between the cohorts.

Figure 37. Expanded data on student progression and success indicators, identifying types of disadvantage.

	Number of Students	Mean Progress Ratio (%)	Std. Deviation (P. Ratio)	Mean Success Index	Std. Deviation (Index)
Disability 1993	9	91.9	14.06	60.6	11.54
Financial Difficulty 1993	127	82.2	25.95	52.7	21.91
Childcare Problems 1993	15	94.5	20.41	62.7	20.38
Eng. Lang. Difficulties 1993	89	77.2	30.82	49.1	24.67
Overall, 1993 Cohort	1,530	81.0	28.39	53.7	23.40
Disability 1994	44	80.7	28.64	49.5	24.10
Financial Difficulty 1994	731	76.8	30.01	48.2	24.12
Childcare Problems 1994	55	89.7	22.71	52.7	24.46
Eng. Lang. Difficulties 1994	233	67.6	33.55	41.1	23.63
Overall, 1994 Cohort	1,556	77.2	29.96	49.0	23.85

Again a chart (along lines comparable to that which appears at Figure 36), provides a more immediate and digestible view of the information presented in the above table (see Figure 38). It is evident from the chart that while in both cohorts, the smaller 'Disability' and 'Childcare Problems' sub-groups performed better than the larger 'Language' and 'Financial Difficulty' groups, these trends were consistent, and do not detract from the previous overview. The better overall performance of the 1993 sub groups is also clear.

Figure 38. Chart of extract data on academic outcomes, by type of disadvantage, showing 1993 and 1994 cohorts separately.



7.5 Combinations of Difficulty

As was noted previously, some participants indicated more than one area of perceived disadvantage, and were therefore counted more than once in the disaggregated data on the performance of students in each of the categories of disadvantage. This warrants closer examination for several reasons: first, a performance which differs significantly from the mean in such a case (ie by more than 0.4 based on an assumed confidence level of 95%, as reported in Chapter 6) will have greater impact on the distributed performance data of the disadvantage groups; second, it is possible that performance patterns may emerge in respect of combinations of disadvantage; and finally, one might expect that trends occurring overall would be exaggerated among those students most affected by disadvantage. Thus a closer inspection might be expected to assist in interpretation of the results.

The total number of respondents who indicated more than one type of disadvantage was 135, and this was distributed highly unevenly, being 18 in 1993 and 117 in 1994. This in itself is interesting, in that the increase (from 1993 to 1994) in the number of students claiming a combination of disadvantage is proportionally greater than the corresponding increase within any of the categories (ref Figure 30). Moreover in 1994 seven respondents claimed three categories of disadvantage, and one respondent listed all four, whereas in 1993 no participants indicated more than two categories of disadvantage.

It is also interesting to note that, of the six possible dual combinations of difficulty, only four were cited by students participating in the study. The two combinations which were not present in the data were physical disability combined with childcare difficulties and physical disability combined with English language difficulties. The combination of physical disability with financial difficulties was, however, present, as might be expected since physical disability is a potential cause of (or contributing cause to) financial difficulty, whereas no such obvious link exists between physical disability and either of the two other factors in question. Moreover, one might suppose that persons considering themselves to be confronted by two significant and unrelated difficulties, where one of these is of the magnitude of a physical disability, may have been less likely to commence an undertaking of the order of an undergraduate course.

The performance of the group of students who listed more than one type of disadvantage was, overall, lower than that of the total group of respondents, however a review of the various different combinations

is possible from the data shown at Figure 39 (below). Since the number of 1993 respondents in this group is small, and since the patterns of results did not appear to vary in any systematic way between 1993 and 1994 respondents in this category, the cohorts have not been considered separately in this analysis.

Figure 39. Comparisons of student progression and success indicators for respondents indicating more than one category of disadvantage.

	Number of Students	Mean Progress Ratio (%)	Std. Deviation (P. Ratio)	Mean Success Index	Std. Deviation (Index)
Overall Performance Both Cohorts	3116	79.0	29.17	59.1	14.85
Performance of participants who did not indicate any difficulty	1947	80.3	28.63	59.9	14.99
Participants who indicated only one category of difficulty	1035	77.0	30.00	57.9	13.88
All participants indicating more than one category of difficulty	135	74.8	31.92	57.4	15.06
Physical Disability combined with Financial Difficulties	16	90.9	16.82	62.2	9.41
Financial Difficulties combined with Childcare Problems	33	93.1	17.68	69.9	12.92
Financial Difficulties combined with English Language Difficulties	90	66.6	33.74	53.3	14.74
Childcare Problems combined with English Language Difficulties	12	86.4	27.59	65.8	17.34
Two categories of difficulty cited (extract of the above four groups)	127	73.8	32.19	56.6	14.53
Three or more categories of difficulty cited *	8	90.8	21.84	70.8	16.72

* Respondents in this category may also have been included in two or more of the relevant dual combination categories.

As can be seen at Figure 39, the performance of respondents who indicated more than one category of difficulty was, overall, lower than that of respondents who indicated only one difficulty. The difference is, however, not as great as the difference between the former group and those respondents who indicated no difficulty. Therefore in general terms it can be observed that second and subsequent difficulties have had a diminishing impact. This finding adds clarity in that it shows that the data considered previously were not unduly affected by the presence of combinations of difficulty among the respondents.

It has also emerged in the data at Figure 39 that trends which were evident overall (ref. Figure 35) in respect of the profile of outcomes for the different categories of difficulty, apply also to the data on combinations of difficulty, except that the performance of those with combinations of difficulty was marginally lower. Again, it was the English Language difficulties groups which were most affected, followed by the Financial difficulty groups. Childcare difficulty groups, which performed best (better than their respective overall cohort means), performed less well when combined with other difficulties.

The combined difficulty results show a moderate additional impact of the second or subsequent difficulty, falling within patterns which might have been anticipated, given the earlier findings.

7.6 From Context to Meaning

There are several observations which can be drawn from the results of this analysis. An attempt to list them follows:

- Students' perceptions of disadvantage, whether collected at enrolment or subsequently, can provide valid and more meaningful data on disadvantage than data obtained by extrapolation from related information.

- Students who identify obstacles early are less at risk than those who do not, and therefore attention should be given to providing students with increased opportunity to understand and accurately self-assess disadvantage.

- Students who identify disadvantage early, and who are provided with appropriate opportunities, can overcome difficulties to match the performance of their contemporaries.

- The management of equity requires that a balance be achieved between the liberalisation of admission policies and the extension of support mechanisms, the consequences of imbalance being under-achievement on equity targets on the one hand, or undesirable attrition and student wastage on the other.

- Students who are better able to make an informed judgement about obstacles facing them (as in the case of the 1994 cohort), may provide a much richer picture of the profile of disadvantage within the student population, and this may conflict with conventional data collected at enrolment.

Whilst the data upon which this study is based are rich with detail about the undergraduate intake at Victoria University of Technology, it is reasonable to suppose that some of the phenomena observed are of equal relevance elsewhere in the higher education sector. For example, it seems reasonable to suppose that data collected at enrolment (regardless of the institution) would generally tend to provide an underestimate of the disadvantage profile. Moreover, such information should be viewed as valuable for the insight it can provide into the resourcing requirements for provision of special support and remedial options, rather than being seen as any kind of predictive tool.

Before self-assessment of disadvantage could be regarded as a reliable tool for use in achievement and maintenance of a balance between open access and support programs, consideration should be given to enhancement of the understanding and information base from which students draw when making these judgements. It is significant that one of the findings of this study points to a key limiting factor in redressing disadvantage being students' own awareness of the need to avail themselves of the support which is provided.

Whilst it is not within the ambit of this program to make specific recommendations, it can be observed that any efforts towards building the knowledge base of intending undergraduates should assist institutions to achieve equity objectives after enrolment. To this end, perhaps it would be of benefit if extension studies programs and orientation programs were to be viewed in a different light.

Chapter 8:

Student Motivation and its Correlates

Among the information collected by means of the survey completed and returned to the program by members of the target groups who elected to participate, were questions relating to aims and goals. The primary intent of these questions was to provide student-centred criteria against which academic results could be referenced in the process leading to formulation of the success indices. However a secondary function of these questions and the data yielded by them rapidly became clear in that they provided useful information and insights on their own, and significantly aided the analysis and interpretation of the data as a whole.

As part of the exploration of facets of the data collected for the program, therefore, attention was turned to the measures of motivation and, in particular, the information yielded by the fifth survey question which concerned itself with respondents' grade aims (ie. whether or not they were aiming for high grades, medium grades, or were 'happy just to pass') as a measure of motivation. This chapter provides an account of the ensuing analysis.

8.1 A Map of Motivation

It rapidly became evident when the survey returns from both the 1993 and 1994 cohorts were analysed, that the patterns of responses from the two cohorts were distributed very similarly between the upper, middle and lower motivation indicators. The second and almost

equally striking aspect of the responses was that a high proportion of students, almost half, registered high motivation, and most of the remainder registered in the middle band. An overview of the responses appears in table format at Figure 40 (below).

Figure 40. Aggregate data on motivation extracted from survey responses from 1993 and 1994 cohorts of participants.

	1993 Respondents	%	1994 Respondents	%	All Respondents	%
High Motivation	705	46.1%	698	44.9%	1403	45.5%
Medium Motivation	624	40.8%	669	43.0%	1293	41.9%
Low Motivation	201	13.1%	189	12.1%	390	12.6%
TOTAL	1,530	100.0%	1,556	100.0%	3,086	100.0%

The similarity between the patterns of responses is reassuring because it points to stability and robustness of the test design; the responses are apparently not arbitrary (since the distribution is unequal), and therefore can reasonably be relied upon as a measure. Moreover, if respondents found the question ambiguous (thus introducing a random element into the responses), a greater variation between the response profiles of the two cohorts might have been expected (Phillips, 1991). As the unequal distribution of responses was repeated for the second cohort, it has been assumed that the responses represent a measurement of a dimension of the phenomenon of motivation among the participating students.

For quite different reasons, the high proportion of students whose responses indicated high motivation is reassuring. If, as suggested earlier, a lack of motivation could be an impediment to achievement,

a large proportion of low motivation respondents could signal educational dysfunction.

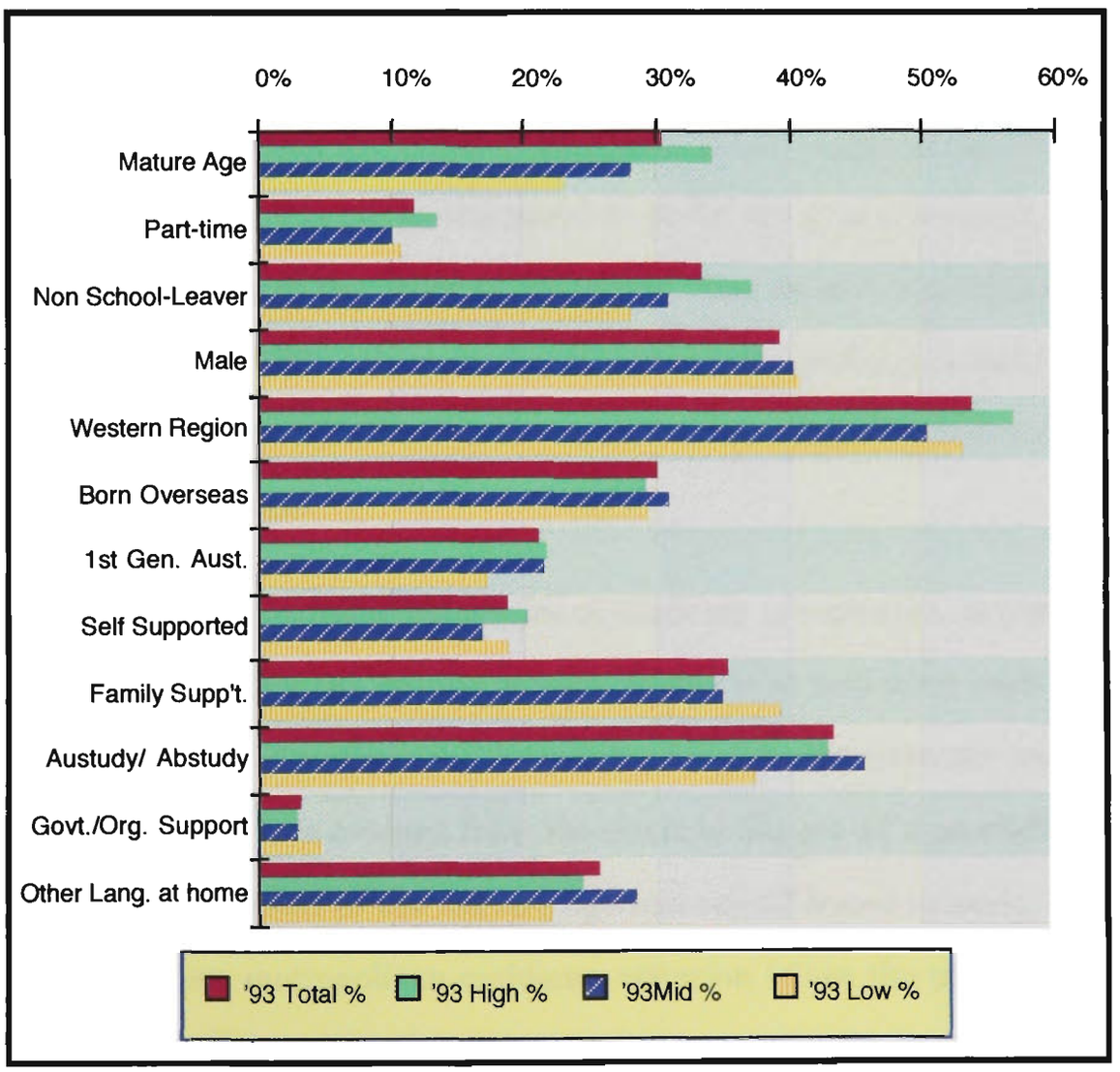
Since no data are available to indicate the study aspirations of those students who did not respond to the survey, it is not possible to state conclusively that the patterns of responses are indicative of the cohort as a whole. However, for the purposes of this study, and given that the respondents were found to be a representative sample on the basis of an analysis of all other available profile and background data, it is assumed that the attitudes to study of the non-respondents were not materially different from those portrayed by the participants. Put another way, there is no basis to assume that a lack of motivation in regard to surveys is linked to any lack of motivation in other spheres of activity.

Equally interesting is the composition of groups of respondents who reported different levels of motivation. Comparisons can be made by analysing the composition of the motivation data within sub-groups selected according to background criteria. For example, in 1993 there were 712 of the 1545 respondents who reported high motivation. Of these, 34.3% (244 students) were mature age. By contrast, 28.0% of those reporting motivation in the middle range were mature age, and only 23.0% of those who reported low motivation were mature age. For reference purposes, it is useful to know that 30.2% (467 students) of the total group of 1993 respondents were mature age. These data are presented in the table reproduced at Figure 41.

Figure 41. Comparison of motivation data provided by 1993 mature age respondents with motivation data on the 1993 cohort as a whole.

	1993 High Motivation	1993 Medium Motivation	1993 Low Motivation	1993 Total
Total Number	712	629	204	1545
Mature Age (No.)	244	176	47	467
Mature Age (% of Total)	34.3%	28.0%	23.0%	30.2%

Figure 42. Motivation bands profiled against background characteristics for the 1993 cohort.



Whilst tables of data on groups of students extracted on individual criteria are useful, the significance of the data are more readily apparent when viewed in graphical form. Therefore a presentation of analyses of the distribution of motivation data for the 1993 cohort, tabulated against twelve background criteria (including mature age), has been provided at Figure 42 (above).

It is noteworthy that each of the groups of data lies within a narrow range, which means that approximately equal proportions of students meeting each criterion were present in the upper, middle and lower motivation bands. In fact the only criteria on which the variation between bands spans 10% or more are mature age and non-school leaver (which are related categories, since the mean age of the non-school leavers is 25, as compared to 18 for the school leavers), the remainder being of the order of 5% or less. This means that among members of the 1993 cohort, motivation was not significantly linked to socio-economic or ethnic/cultural status, but was linked, albeit only marginally, to age.

Although all identifiable categories of students are present in similar proportions among the groups of respondents who indicated each of the three levels of motivation, the points of visible variation are worth some comment. It is evident from the chart at Figure 42 that higher motivation is linked to the mature age/non-school leaver criteria, and to the western metropolitan residency criterion (since the proportion of high motivation respondents in these groups exceeds either the medium or low proportions), and attenuated motivation is linked to

dependency on AUSTUDY/ABSTUDY as the main source of financial support, and use of a language other than English at home.

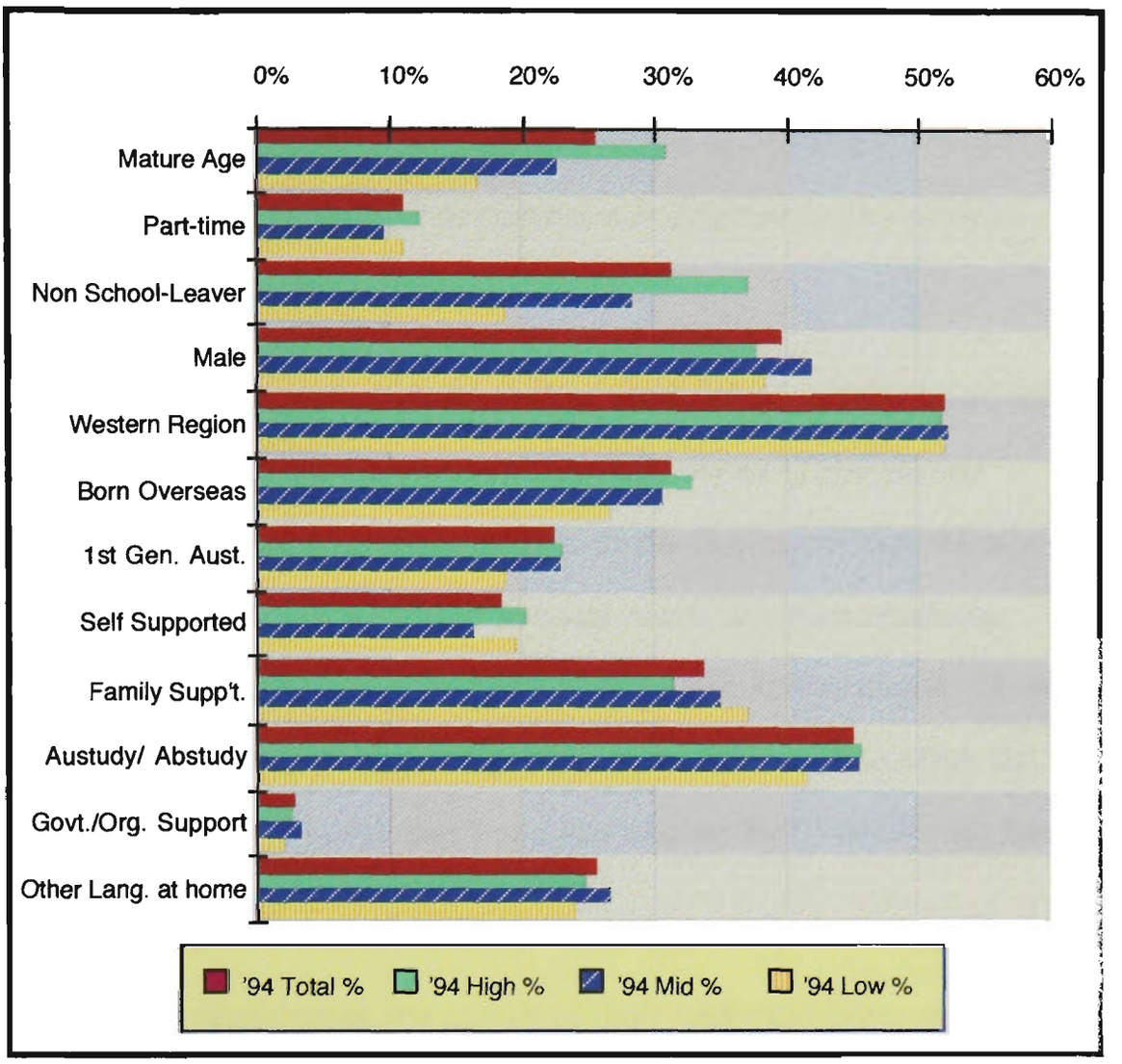
The next step in examining profile data on motivation is to see if a similar pattern occurred in the responses from the 1994 cohort. Since identical data are available on all twelve criteria for both cohorts (with the exception that data on "language spoken at home" were coded differently and have, therefore, been scaled here for the purposes of comparison) it is possible to reproduce the graphical presentation of motivation against background characteristics in the same way for 1994 as for 1993. The resulting chart is included as Figure 43.

It is readily apparent on comparing the charts in Figures 42 and 43, that the criterion groups are represented in similar ratios in each cohort (meaning that the 1993 and 1994 cohorts are similarly composed) and that the 1994 pattern of motivation responses is also similar to the pattern which was achieved in 1993, with approximately equal representation of socio-economic and ethno-cultural groups in the upper, middle and lower bands of motivation.

In 1994, however, the association of high motivation with the mature age and non-school leaver categories is a little more pronounced than was the case among the 1993 data, and the other variations noted in 1993 are less evident.

This result supports the observations made from analysis of the 1993 data and lends support to the view that motivation is linked to age.

Figure 43. Motivation bands profiled against background characteristics for the 1994 cohort.



This finding, which links motivation to age is in accord with commonsense, relating readily to our experience of younger students who may be less certain of their future and whose sense of self may continue its rapid development throughout their studies. Older students, by contrast, may have taken time to form a clearer picture of themselves and their strengths and opportunities. If nothing more, it can be assumed that older students have, in general, had more time to identify and understand their own needs and aspirations, so it would be surprising if this were not evident in the results of an analysis of motivation.

To facilitate comparison and more thoroughgoing analyses of the motivation responses returned by different groups of respondents, it was considered desirable to devise a simple indicator of the proportion of high, medium and low responses among returns from a given group or sample. Consideration was given to several ways to treat the data for this purpose.

Before proceeding, it is helpful to first consider what lay behind the data collected via the surveys. The starting object of the survey question from which motivation data in the thesis are derived was to ascertain the level of weighted average mark to which students aspired, for comparison with their subsequent achievement. There were, however, two reasons why a direct question to this effect (ie. "What weighted average mark are you aiming for?") would not have been appropriate:

a) because students at the outset of their undergraduate studies would be unlikely to be in a position to make the finely tuned judgement to provide a meaningful number (anywhere between zero and one hundred), and to ask them to do so would be unlikely to produce a meaningful outcome, and

b) because students would not, at this point, have become familiar with the grading system of the University, much less weighted average marks.

The first shortcoming could have been addressed by providing a structure within which students' answers could be generalised into

bands, to make the choice clear and simple (and reasonably within the reach of commencing students), as follows:

What approximate level of 'weighted average mark' are you aiming for during your studies??	85 ☐ 70 ☐ 55 ☐

However this would have necessitated a lengthy supporting explanation of the weighted average mark which students would have had to read and comprehend in order to respond appropriately. Instead, the question was re-cast in language which could be readily understood by the survey respondents:

What marks are you aiming for during your studies??	high grades ☐ better than pass ☐ happy just to pass everything ☐

Thus although the data collected in this way principally convey the ranking or ordering indicated by respondents (ie they are 'ordinal' data), the ordinal scale is notionally linked to underlying mark ranges at intervals of approximately 15 points. This begs the question as to whether it would be reasonable to convert the data to integer equivalents (ie treat them as interval data) for further analysis. To do so would be, in part, to assume that, where the intervals upon which respondents' answers were notionally based were greater or smaller than the fifteen point scale envisaged, these individual differences would be offset when the data are averaged across a large sample.

The treatment of ordinal data using parametric procedures remains controversial, and, it appears, is regarded by some as unthinkable (Cobbin & Barlow, 1993). There is, however, an alternative view.

In a recent review of indicator techniques which have application in economic and social science research, it is suggested that for aggregation, ordinal scales must be cardinalised (on the basis of a 'preview and prethink' of the constituent statistics), and that having been so treated, ordinal data may lend themselves to simple treatments such as arithmetic averaging (Horn, 1993). This view is echoed elsewhere, and is held to be broadly applicable across other fields of research, it being argued that concerns about subjectivity, discontinuity or distributional abnormality can be more than adequately countered by thoughtful application of the initial scale and the application of standard techniques which are robust to rounding and distributional departures (Box, 1986).

In light of these considerations, it was determined that a numerical index could be developed, based on the motivation data from survey responses. The motivation data which are used in the thesis are treated as interval values because: the context of the survey question and the nature and imputed meaning of the data would suggest relative consistency of the intervals between the low medium and high grade indicators, the data are drawn from a population which was normally distributed (ref. distribution data and profiles of responses provided Chapter 5), and the sample size was large (3,117), providing for sub groups of ≥30. Variations in imputed interval range in individual records would therefore contribute less than 0.5 points to the subgroup index (a significance level of 1.0 was applied).

In order to effect a distribution of the responses over a range of equivalent magnitude to the mark range to which they relate (ie.

from 55 to 85), 15 point weightings were, therefore, assigned to the band groupings to produce an index of grade aims which was termed the motivation index.

Thus a weighting was allocated to each of the motivation bands: low = 15, medium = 30, high = 45, to produce an index of motivation. Mean motivation indices were then calculated and cross-tabulated with age. These data are presented in the table at Figure 44.

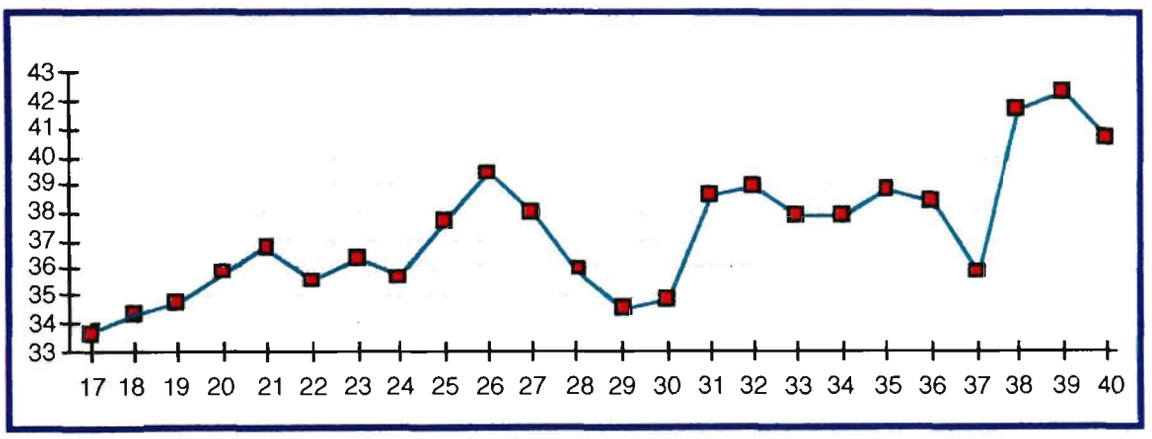
Figure 44. Motivation weightings and frequency by age from 17 to 40 (ie. showing the number of students of each age).

Age	Number of Students	Motivation
17	694	33.7
18	1138	34.3
19	310	34.7
20	167	35.8
21	145	36.8
22	104	35.5
23	74	36.3
24	56	35.6
25	45	37.7
26	43	39.4
27	32	38.0
28	28	35.9
29	34	34.0
30	28	34.8
31	21	38.6
32	27	38.9
33	17	37.9
34	19	37.9
35	17	38.8
36	16	38.4
37	20	35.3
38	9	41.7
39	11	42.3
40	7	40.7

NB: Age cohorts outside the 17 to 40 range were too small to provide useful data for comparison.

The mean motivation index (calculated as described above) for seventeen year olds was 33.7, and rises, albeit in a somewhat unpredictable fashion, to a mean of 42.3 for those aged 39. In fact, the gradual increase of motivation with age is uniform between the ages of 17 and 21. The data can be scanned with greater ease when plotted graphically in the form in which they appear at Figure 45.

Figure 45. Line chart of mean motivation index by age from 17 yrs. to 40 yrs. (including all respondents within this age range).



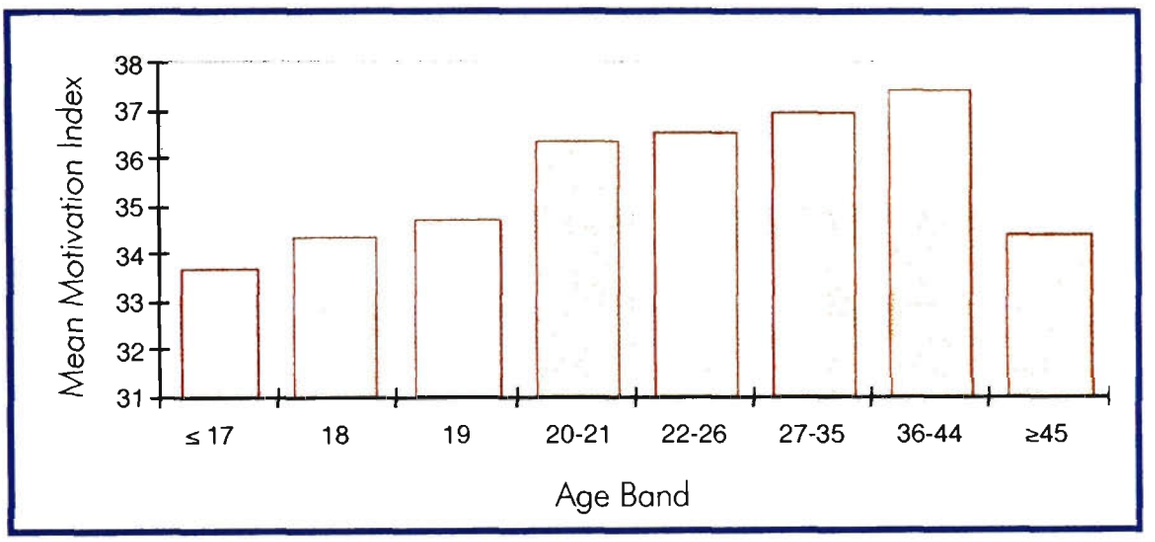
Above the age of 21 the increase in motivation ceases to be uniform. However this is, in part, accounted for by the small numbers at each age, reducing from 104 students at age 22 to a grand total of 7 students at age 40. With numbers of this magnitude, random measurement errors or individual variations can have a significant effect on the group mean. When age bands are chosen so as to keep the number of students in each band relatively constant, the effect is more uniform as can be seen in the table of data at Figure 46.

The data so derived are also represented in the form of a bar graph, which has been included as Figure 47.

Figure 46. Mean motivation indices by age bands (showing the number of students in each band).

Age Band	≤ 17	18	19	20-21	22-26	27-35	36-44	≥45
Number	699	1138	310	312	322	223	81	31
Motivation Index	33.7	34.3	34.7	36.3	36.5	36.9	37.4	34.4

Figure 47. Bar graph showing mean motivation indices profiled against age bands (1993 and 1994 cohorts combined).



As was seen previously, the variation in motivation according to factors other than age is insignificant. This is not to say that a variation did not exist, but that it was not of a sufficient magnitude to have a decisive impact upon results elsewhere in the study. For example, the mean motivation index for males was 34.7 as against 35.1 for females. This variation (0.4 on a scale from 15 to 45) is minor in comparison to the age factor which accounts for a variation of up to 8.6 points on the same scale. For this analysis, a significance level of 1.0 has been applied (based on an assumed confidence level of 90% and group size ≥150). Bearing these findings in mind, a further dimension of the motivation data which are the subject of this analysis is worth viewing at this point: the relationship between

motivation and field of study. By viewing the mean motivation index for each Faculty of enrolment (see Figure 48), it can be seen that a variation of 3.5 index points exists between the Faculties.

Figure 48. Tabulation of motivation and age by faculty of enrolment.

Faculty	Arts	Business	Engineering	Human Development	Science	All
No. of Students	471	1048	351	761	485	3116
Motivation Index	36.3	33.8	32.8	36.0	35.9	34.9
Mean Age	22.1	20.2	19.4	20.1	20.5	20.4

A variation of 3.5 points is small by comparison with the impact of age, but could be significant. However, when the mean ages of students in each of the faculties is added to the picture, it becomes clear that the age differential between faculties accounts for most of the motivation variation. In addition, part of the remaining variation can be accounted for by gender, as the faculties with higher mean motivation indexes (Arts, Human Development) are also those with a majority of female students among respondents (76.4% and 76.2% respectively), as against faculties where females are a minority (eg Engineering, with 18.5% females among respondents). When the variation in motivation between faculties is adjusted to account for age and gender differences, it is no longer significant.

To the extent that students may be assumed to possess motivation when they arrive at University, as a qualitative feature of their value as raw material, as it were, then this finding is significant. Especially so, given that in the move towards a mass higher education system in Australia, two themes dominated tertiary

education policy at the Federal level: the need to reduce wastage, improve completion and graduation rates and the maximisation of opportunities for school leavers.

If motivation is a significant factor influencing students' success and retention, then the dual policies of youthful intakes and efficient throughput can be seen to have been incompatible.

8.2 Motivation Becoming Momentum

The next step in investigation of the data available about motivation is to compare results achieved by students participating in the study with their aspirations.

The interleaving of fact which derives from subjective assessment (rather than from observation and measurement), with quantification and statistical descriptions and tools as an aid to analysis and understanding has been a recurring theme within the account of this program. It is, therefore, no less appropriate at this point that the data yielded by an attitudinal measurement instrument relating to motivation are tabulated against the academic progress indices, which are themselves the outcome of subjective decisions of examiners and students.

It should be noted, however, that since the motivation data provide part of the basis for calculation of the success index, comparison between the motivation and success indices would involve recursion in that one would in part be, albeit indirectly, comparing something with itself.

Reference has been made above (see Chapter 2) to previous studies which have indicated links between students' motivation and subsequent academic outcomes at university. In commencing this analysis of the correlates and profiles of motivation among the participants, it was anticipated that the influence of students' motivation would be reflected in their subsequent academic performance. However, as well as conducting an investigation to test this assumption, the work which follows set out to ascertain the nature and extent of any such link.

The measures of academic performance which are used in this analysis are the "progress ratio" and the "weighted average mark", both of which were described and discussed in Section 2. Since the former can be viewed as a measure of quantity of achievement and the latter of quality, in combination they provide an indication of the results achieved. Again, the results used in these calculations are those which participants obtained within their first full academic year of study.

Figure 49. Motivation data from the 1993 respondents cross-tabulated against academic performance in first year studies.

	Number of Students	Mean Progress Ratio	Standard Deviation (Progress Ratio)	Mean Weighted Average Mark	Standard Deviation (W.A.M)
1993 High Motivation	705	87.4	23.84	63.5	12.72
1993 Medium Motivation	624	78.7	28.41	57.4	12.24
1993 Low Motivation	201	66.1	34.85	51.9	15.67
1993 Participants (all)	1,530	81.0	28.29	59.5	13.59

The academic performance data, achieved by application of the formulae described above to 1993 first year results data for the participating students, are presented in summary form at Figure 49.

It is immediately evident on surveying the table reproduced at Figure 49 that, in the 1993 data, a relationship existed between motivation self-assessed and reported by students completing surveys during semester one, and students' overall first year performance against the criteria of both quantity and quality. A further review of the data showed that this relationship remained roughly constant across fields of study and other background characteristics including gender and ethnicity. Having observed this result, it is interesting to note that it has been closely matched by the first year results of the 1994 cohort which are shown at Figure 50.

Figure 50. Motivation data from the 1994 respondents cross-tabulated against academic performance in first year studies.

	Number of Students	Mean Progress Ratio	Standard Deviation (Progress Ratio)	Mean Weighted Average Mark	Standard Deviation (W.A.M)
1994 High Motivation	698	84.3	25.89	62.3	13.23
1994 Medium Motivation	669	74.1	30.55	55.8	12.85
1994 Low Motivation	189	62.1	34.10	50.1	13.79
1994 Participants (all)	1,556	77.2	29.96	58.0	13.80

The similarity of the first year academic progress data distributed across the motivation bands between the two years is of the same order as the variation between the performance of the groups as a

whole between the two years. The fact that the pattern was repeated in successive years adds weight to the view that a relationship exists between motivation and outcome.

The discovery of a relationship between student motivation and academic outcomes was not entirely unexpected; it makes sense that ability and opportunity are of little value to the individual without the inclination to use them. If a lack of inclination (or motivation) logically coincides with a lack of success, then the converse should also hold true. Moreover, as indicated earlier, in the epic search for improved predictors of academic performance (with a view to improving selection techniques and thus reducing 'wastage'), several studies of non-academic and non-intellectual correlates of academic performance (Anderson, 1961; Entwistle et al, 1971; West, 1985) have shown various measures of motivation to correlate with academic results.

One must acknowledge at this point that, to the extent that the link between performance and motivation can be assumed to be causal, there may be some circumstances in which causation may flow in either one direction or the other, or even in both directions. That is to say there may be many cases where the extent of a student's success may be attributed in part to that student's motivation. There may equally be some cases where a student's desire to succeed is sparked or piqued by initial unexpected successes, so that motivation results from success rather than causing it. It is probable, however, that motivation, whatever its cause, would become a positive contributing factor to subsequent academic outcomes. The same bi-directional

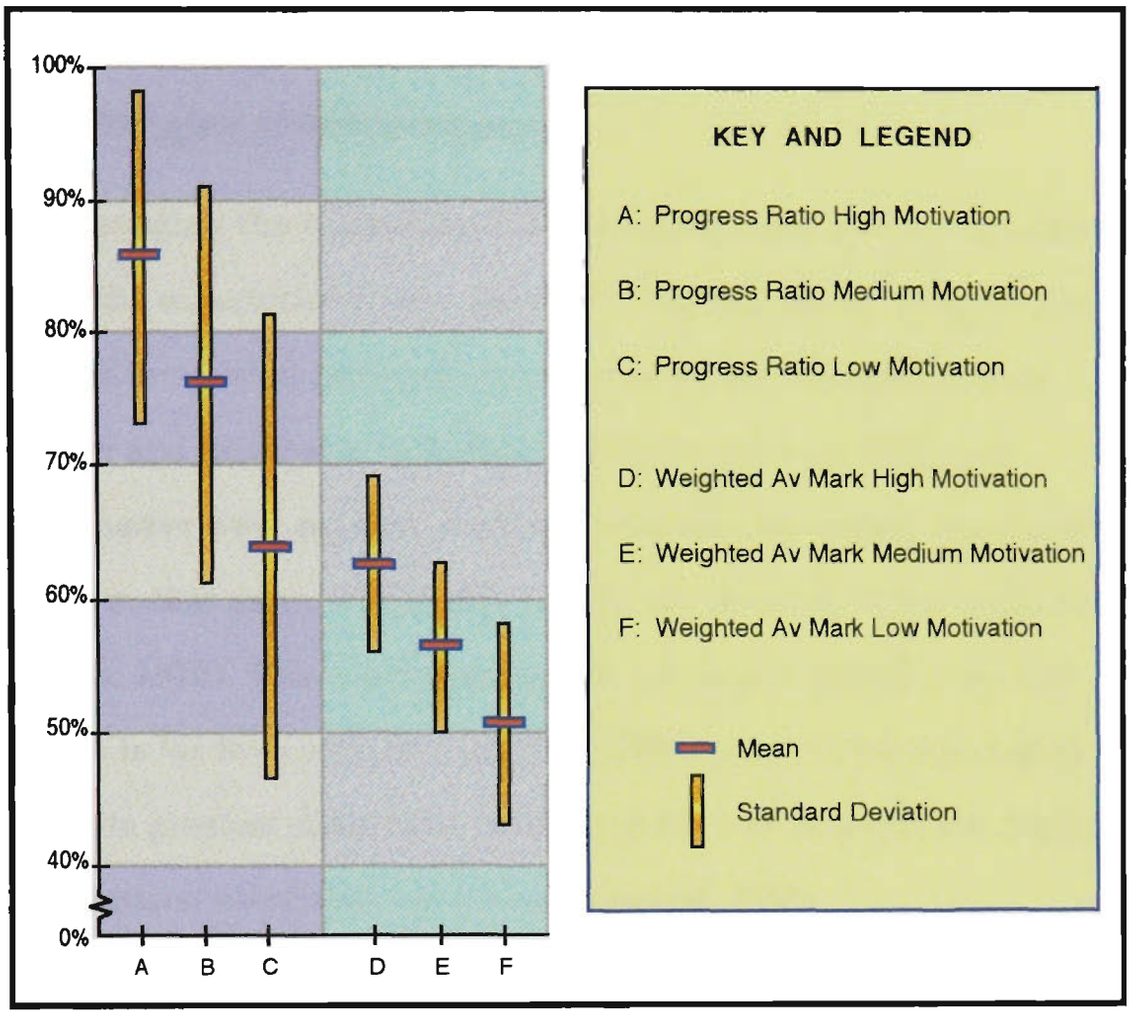
causal scenario may exist in respect of low motivation where the students whose best efforts produce little reward may become less motivated as a consequence. Regardless of the direction of causation, the link between motivation and success is of importance, and is sufficiently strong to be broadly noteworthy.

Having established that a relationship between motivation and outcomes is equally evident in the analysis of data on each of the cohorts separately, it makes sense to view the data in aggregate, for what they can reveal about the profile of academic performance of the motivated student.

Represented graphically, the overall results of cross-tabulation of motivation against academic performance (both cohorts together) clearly demonstrate the relationship between students' stated aims and aspirations and the results they subsequently achieved (see Figure 51).

It should be noted that, in the graph at Figure 51 participants in the medium motivation band (ie the bands plotted at 'B' and 'E' on the horizontal axis), performed close to the overall mean on both the progress ratio ('B') and weighted average mark ('E') measures, and that participants in the high motivation band (plotted as 'A' and 'D' on the horizontal axis) performed close to a full standard deviation better than those in the low motivation band ('C' and 'F') on both measures.

Figure 51. Detail of chart showing academic performance against motivation indicators for 1993 and 1994 cohorts combined.



This confirmation of the association between motivation and outcomes serves to reaffirm the validity of the test design and the student self-assessment on which it was based. It must be remembered that students were not asked to indicate their expectations or to predict their results, but to state their aims. The conclusion which can be drawn from the comparison of survey responses with results is that there is an association between students' high aims and their high achievements, and that, as outlined above, a bi-directional causal link is imputed. It is

concluded, in part, that students did better because they aimed to do better. Motivation in action.

8.3 Origins of Achievement

In managing the continuing move towards mass higher education, with the expectation that a majority of the population can and will benefit from what universities can provide, the reconciliation of access and excellence in higher education must be addressed. Alternative ways must be found to demystify, to recruit, select and teach so that many will be able to do what once only a few could do (Little, 1970). This is a process which was begun decades ago, but which is far from complete (Karmel, 1991), and can be expected to offer its greatest challenges in terms of the rate of growth in student populations within the next decade (Anwyl, 1995).

One of the concerns which has underpinned much of the debate about the direction and pace of change in higher education, is the validity (or otherwise) of the concept of a limited *pool of ability* from which higher education can draw, and on which it can build (Vernon, 1963). This concept was rejected by Vernon in 1963, and in 1965 by a (then) eminent Melbourne researcher, who produced evidence that there were many able children who were not even getting close to university education (Anderson, 1965). More recently, the fallacy of this theoretical construction has been demonstrated, and its negative impact on the development of frameworks within which to address educational inequality has been understood (McCallum, 1990).

As early as 1949, as a result of investigations into the value of tests and examinations as predictors of success at university, it had been ascertained that a minimum level of intelligence was a necessary but not sufficient condition for success, and that above this minimum, high levels of success at university did not seem to depend on high intelligence or high *tertiary entrance scores* (Hohne, 1949). Taking this finding further, it was demonstrated through a case-study based project that a principal cause of failure was not lack of ability but lack of effort (Dale, 1954). Since it is reasonable to assume that effort is linked to motivation, this study provides evidence of the extent to which students of similar origins and with similar opportunities can succeed or not according to their perceptions or attitudes rather than their abilities.

In the face of the challenges of the era of mass higher education, it can be shown that teaching practices which make the curriculum more broadly accessible and openly tap students' individual goals and aspirations outstrip conventional lecture/tutorial formats (Terry, 1995). It has been demonstrated that this challenge is even more marked in relation to off-campus study modes, which have been characterised by a greater performance differential between school leavers and mature age participants (Long, 1994). The successful university in the mass higher education system of tomorrow, will be the university with an environment, a curriculum, a vision and a framework for its delivery which engages and involves, inspires and motivates.

8.4 An Argument for Wider Applicability

Recognising that this study draws on data relating to students from only one university, some consideration should be given to the extent to which conclusions can be reached which will be applicable elsewhere.

It was established that the composition of the survey respondents in each of the motivation bands was similar. Likewise, in Chapter 5 it was demonstrated that each identifiable group within the cohort was present in roughly equal proportions in the three bands of motivation. The student population of Victoria University of Technology is particular to its region, and to its philosophy and mission. However the profile of its student body nevertheless substantially overlaps with that of other universities in Australia (Department of Employment, Education and Training, 1995). Whereas the proportions of students of particular backgrounds may be represented in greater or lesser numbers in the university population, there are few identifiable groups which are not represented at all. To put it another way, the mix may be different but the ingredients are the same.

Since each identifiable student characteristic other than age remained constant across the bands of motivation, it can be inferred that this would also be true in other higher education institutions. Moreover, using similar logic, since the link between motivation and outcome remained constant between cohorts and also at the level of constituent groups (gender, ethnicity, faculty etc.) it could reasonably be expected to be present elsewhere in the Australian higher education system.

8.5 From Motivation to Meaning

It is important that students' stated aims have been shown to be self-actualising. The findings of this study show students' statements of high aspirations to be self-fulfilling prophecy, and lend support to the assumption that they were accompanied by energy, interaction and application to the opportunities which a university place holds. If they are to succeed, students must be encouraged to choose paths for which they feel real enthusiasm.

It is useful to consider why age may be linked to motivation. Time brings to the potential student the necessary opportunities to establish independence and identity, to consider priorities. Older students more frequently know what they want to do and why. All this could form part of a picture of motivation. Whatever the reasons, however, it is apparent that among the students participating in this program, those in the 'over 20' age range were able to achieve more and were less at risk. This confirms and extends the findings of earlier studies (Hong, 1983; Richardson, 1994) and presents an unfortunate contrast with the pressure for increased school-leaver enrolments under which higher education institutions in Australia operated for over a decade.

Although a shift of emphasis toward the admission of older students in greater measure would appear to be justified on the basis of the findings of this study, it must be remembered that significant numbers of highly motivated students are present within each age band, so significant change would not be appropriate. Beyond age, the

findings of this analysis point to no other factor which would enable institutions to select for motivation.

An apparent inability to select for motivation is not the impasse which it might appear, but suggests a change of focus. Having admitted students (perhaps on the basis of more open rather than selective procedures), it is incumbent on a university to provide an environment which stimulates and maximises motivation. There are opportunities for further research in this direction.

Fortunately, students who are not motivated at all rarely find themselves enrolled in higher education institutions for any length of time. However, it would seem likely that any effort to select motivated students, to motivate selected students, and/or to preserve and sustain student motivation, would be directly reflected in the quality of students' achievements. Dedicated economic rationalists can be expected to see an improvement in grades, increased pass rates, more students completing in minimum time and a reduction in failure/wastage. The rest of us might prefer to think in terms of improved quality, a greater depth of learning, a more rewarding and even enjoyable university experience.

Chapter 9:

Score-Based Selection in Action

It was observed in Chapter 2 that much of the body of research within universities on student success and student selection spanning the latter decades of this century, has concerned itself in one form or another with grades or scores. Particularly, research since the 1950s and 1960s has built a body of knowledge about the relationship between scores achieved by senior secondary education students, and their subsequent achievements within the university system.

It is part of the underpinning purpose of this analysis to move beyond the territory which has elsewhere been so thoughtfully and thoroughly explored, in two ways. Firstly, by paying primary attention to factors other than scores in the background profile of intending tertiary students (whilst nevertheless relating these factors to first year study outcomes), and secondly, by conducting such investigations within the altogether changed context of the mass higher education system which prevails in Australia in the 1990s. This changed context is nowhere more evident than at Victoria University of Technology, where on every dimension, the student population departs radically from that which one might expect to have found in the Australian Universities of preceding decades.

It is with this latter consideration in mind that the view was formed that the analyses conducted within the program would be incomplete unless some attention was paid to the use and effect of tertiary entry scores within the new and changed context of which Victoria

University of Technology provides such a characteristic example. Moreover it makes little sense to conduct an evaluation of alternative approaches to evaluating the merits of future candidates for admission to higher education courses unless one is in a position to directly assess existing practices. For these reasons, before moving to describe and trial the construction of alternative indices for understanding and perhaps predicting performance, a brief review of the nature, objects, impact and limitations of score based selection has been conducted, based on an analysis of available data on members of the target groups for the program.

One of the difficulties encountered by researchers, such as Hohne earlier in the century, was that whilst it was possible to check the effectiveness with which a given procedure selected students who would succeed, it was not possible to ascertain how many of those who were rejected as a result of such a procedure might have succeeded had they been admitted (Hohne, 1951). At that time only a very small proportion of a given cohort of school leavers was given access to university education and, as discussed earlier the debates as to whether there was in fact a limited pool of ability were still current. We now see daily proof that university courses which continue to demand high standards, can accommodate a far greater proportion of the population than was customary at that time, whilst still offering reasonable prospects of success to a significant majority of those admitted. The population of students at Victoria University of Technology in the 1990s would, perhaps, have been of considerable interest to Hohne and Vernon some four decades earlier.

It is also interesting to note that at the time of genesis of the program and during its early years, tertiary entry scores and score based tertiary entrance ranks have remained the dominant method for selection of school leavers for admission to universities throughout Australia, including Victoria University of Technology. Notwithstanding this, the context within which predictive selection is now applied differs markedly from the prevailing conditions in former decades when much of the formative research on the validity of scores as predictive measures was undertaken. However within the months during which this thesis was in final editing, earnest policy discussions have commenced within the University about possible radical changes to admission practices which may result in at least a partial diminution of the role of tertiary entry scores in selection of undergraduate entrants.

In light of renewed interest in the issues attached to score based selection both within and beyond the University, the following analysis concerns itself with the tertiary entry score performances of the 1994 participants (score data were unavailable for 1993), and relates this analysis to the data and the findings discussed in previous chapters.

9.1 Selection for Success

It has been noted previously that, since the advent of significant Government support for Australian higher education during World War Two, intake quotas have governed local undergraduate admission processes (McDonell, 1975). Arising from pressure for

improved efficiency and reduced 'wastage' applied in the wake of the Martin Report in the 1960s, universities in Australia, as in some other countries, have faced the problem of selecting students who have prospects of success (Anderson, 1963). Moreover, as long as course and institution quotas continue to apply, a selective approach to the management of the annual intakes into undergraduate courses seems likely to persist, and alternatives such as open admission remain uncommon in Australia (McCallum 1990).

In addition to the changes in the scale and nature, structure and content of higher education in recent decades (Marginson, 1993; Moran, 1995), there has been recognition of a wider range of outcomes, taking account of the social, cultural and economic impact of higher education, along with the academic considerations which were once the primary focus (Boyd & Smart, 1987). In the context of the continuing dominance of score-based selection for undergraduate courses in the Australian higher education system, it is reassuring to be reminded of parallel developments by works such as the study of the performance of equity groups and students admitted via alternative modes of entry (Lewis, 1994) and the recent exploratory study of students' experience in diverse and non-traditional learning environments (Terry, 1995). These studies look beyond tertiary entrance ranks to provide insights into the myriad factors which affect students' experience at university, and which influence outcomes both academic and otherwise.

Notwithstanding the widening ambit of undergraduate education and of the discourse on selection, admission and teaching/learning,

it remains appropriate that continuing attention be paid to prediction and score based selection. This is because although score based tertiary entrance ranks remain the dominant method for selection of school leavers for admission to universities throughout Australia, the context within which predictive selection is now applied differs markedly from the prevailing conditions at the time when much of the formative work upon which current procedures are based was undertaken.

9.2 The Availability of Data

In the State of Victoria, Tertiary Entry Scores over the first half of the current decade have been something of a moving target. Three markedly different procedures for the derivation of a selection tool from students' year 12 secondary results have been in effect over the past six years, the latest of which is the production of a tertiary entrance rank (TER) by application of a regression algorithm which scales and combines study scores so as to counteract the effects of differing levels of competition on the rankings students achieve in individual curricula.

Prior to adoption in 1995 of the current procedure which leads to selection for tertiary entry based on a single TER expressed as a percentile, scaling and scoring were applied to produce a composite score. However, the formulae used were modified to accommodate the full implementation of the Victorian Certificate of Education in 1993 (and it was these 'new format' scores which were used for

selection and admission for 1994). Thus the scores which were used as the basis of selection in 1993 and 1994 were not comparable.

In preparing to undertake this analysis, inquiries were made about the availability of data on the scores achieved by entrants in each of the years of study under investigation within the program, and it was ascertained that until 1993, computer files of selection data containing scores had not been routinely available within the University, and that those files which had been received during the 1992/3 selection round had not been retained. Files of selection and admission data for 1994 entrants, however, were accessible, and were made available to the program by the University for the purposes of this analysis.

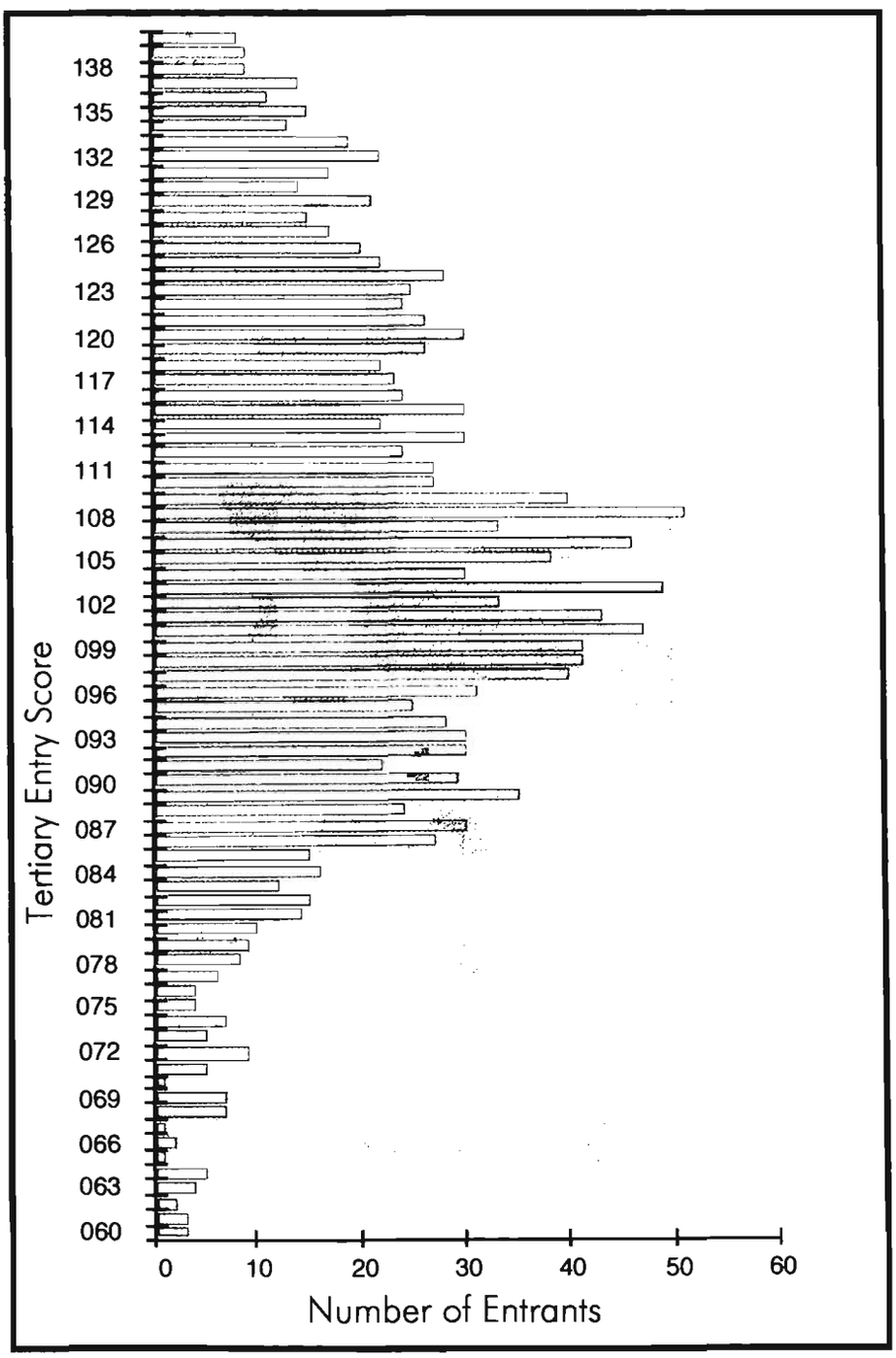
Since no composite analysis of the entry scores of the 1993 and 1994 cohorts of entrants would have been possible given that the basis of year twelve scoring in 1992 and 1993 (the years when the school leavers who became university entrants in 1993 and 1994 obtained their year 12 results) was not comparable, the program faced the options of undertaking separate analysis in respect of each of the years under investigation, or exploring only one of the years. The fact that data on the 1992/3 selection round were not readily available provided the added impetus for a decision to confine the investigation to the 1994 cohort.

9.3 The Distribution of Tertiary Entry Scores

Of the total undergraduate intake into first year in 1994, 1,713 students who were new to the University had a Tertiary Entry Score

which was available at the time of admission. Moreover, 926 of the survey respondents were scored entrants. The distribution of 1994 Tertiary Entry Scores among the entrants is provided at Appendix 7. For the purposes of this overview, the distribution is also presented graphically at Figure 52.

Figure 52. Chart depicting the distribution of tertiary entry scores among 1994 first year undergraduate entrants at Victoria University of Technology.



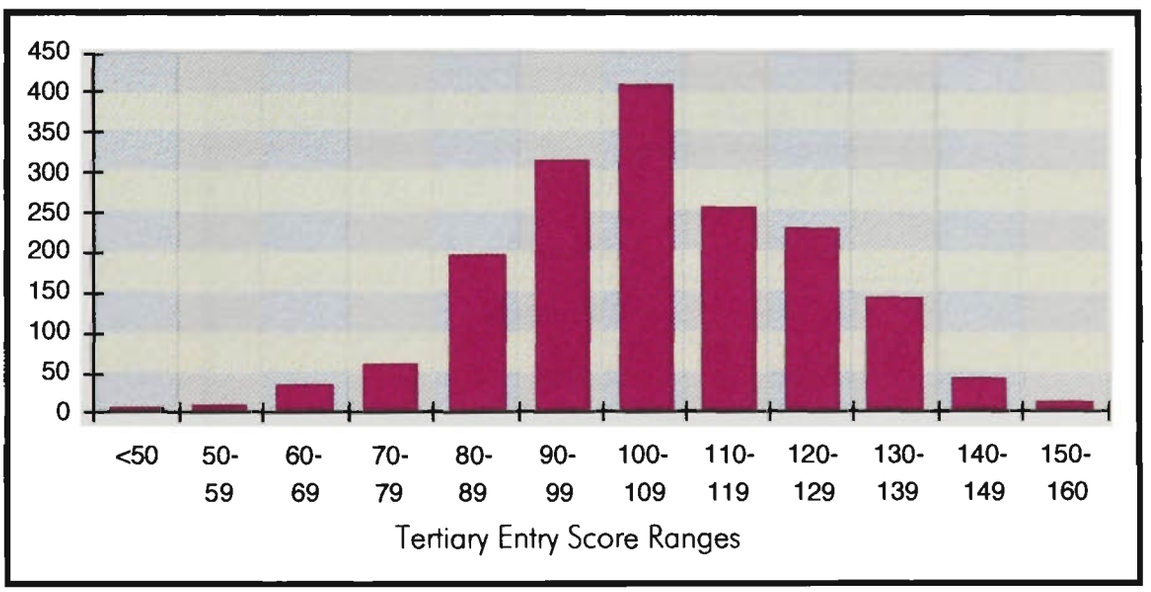
As can be seen on inspection of the profile of the graph at Figure 52, the distribution of scored entrants is relatively even and approximately corresponds to a "normal distribution". It must be noted that this effect cannot be observed at the level of individual courses where the distribution is altered by competitive selection, such that it can be expected to drop away sharply at the lower end (at the point of the 'cut-off score'), and to be modified at the upper end by the effects of applicant preference patterns and the cut-offs of competing courses elsewhere in the state system. When the data from all courses within the University are aggregated, as shown above, the effects of individual course selection are reduced, and the cohort can be viewed again as a population, more closely conforming to a normal distribution. Despite the effect of aggregation of the data appertaining to numerous courses, it can nevertheless be seen at Figure 52 that as a result of selection score cut-offs, the population drops off more sharply below the mean score (106.1) than above it.

Despite the visible pattern in the distribution of scores among the population of entrants, there are fluctuations at various points, making the examination of groups of students at individual score levels subject to the variability of the population anomalies caused by course grouping around cut-offs. That is to say, a number of courses have a significant population of entrants at and above the course cut off, creating a peak in the overall pool of entrants at this point. In examining individual score populations, one would therefore expect to find particular courses over-represented at certain score levels. In comparing the populations at adjacent score levels where there was little to differentiate students in terms of their year 12 performance,

then, one would to some extent simply be comparing the characteristics of different course groups.

For the purposes of analysis of Tertiary Entry Scores and their relationship to other factors in this review, entrants have been grouped into bands by score, where each band is comprised of a ten score range (with the exception of those whose score was below 50; there are so few at this level that it has been decided to treat them as a single group). In this way twelve bands of scored entrants are produced. The effect of a normal distribution is more easily recognised when the data are presented within these bands, as shown at Figure 53.

Figure 53. Tertiary entry score distribution recalculated on the basis of ten point score bands.



9.4 The T.E.S. Performance of Specific Groups

Among the 1994 entrants who were scored school leavers, various sub-groups can be identified, and it is worth checking whether or not the entry scores associated with key groups who can be identified

according to criteria used previously in analysis of data in this program, differ significantly.

The approach taken here to comparison of the Tertiary Entry Score performance of identifiable sub-groups is to calculate the mean tertiary entry scores associated with each sub-group population extracted from among the scored entrants according to the criteria indicated. The results of this process may be found in the table which is presented at Figure 54. It should be noted that some of the indicators which have been used previously, such as age and basis of admission are unsuitable in this instance since, by definition, most if not all members of the group of school leavers who entered with scores in 1994 will fall within the same category on these indicators.

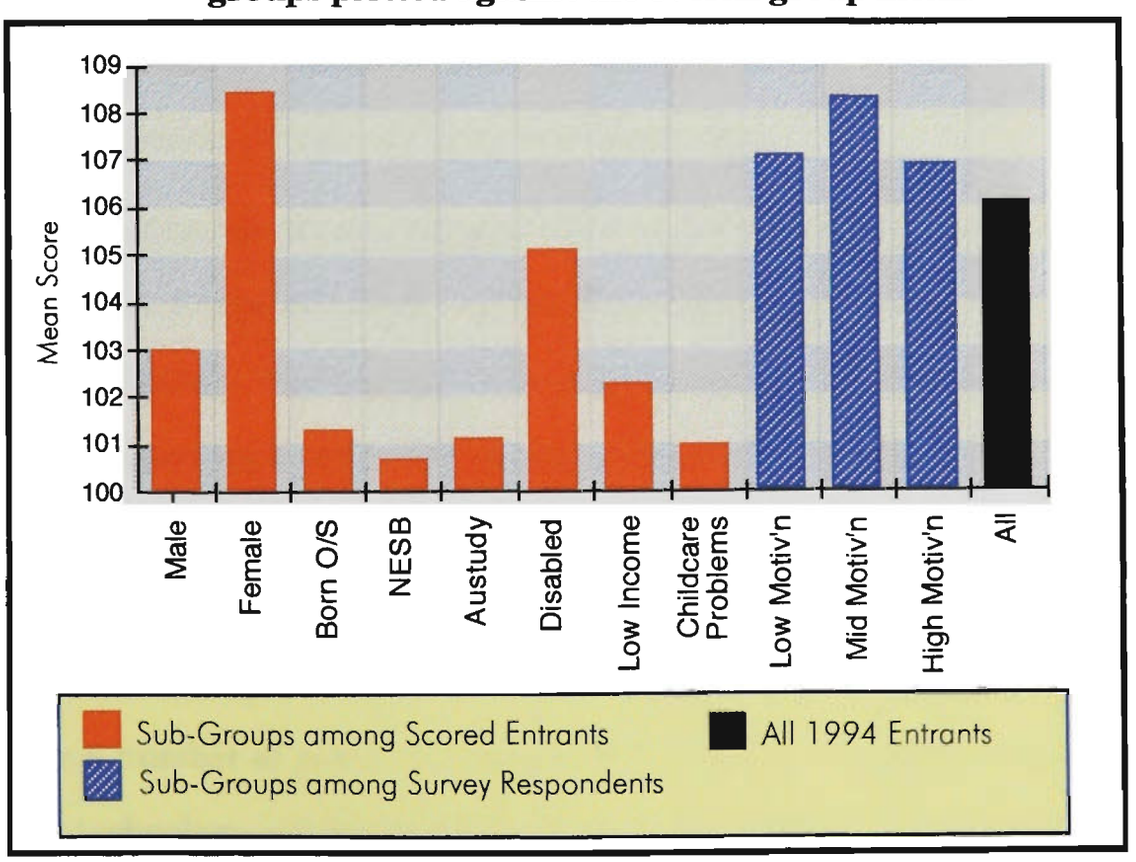
Figure 54. 1994 entry score performance of designated groups of entrants.

Designated Sub-Group	Mean T.E.S.
Male	103.0
Female	108.4
Born O/S	101.3
NESB	100.7
Austudy	101.1
Disabled	105.1
Low Income	102.1
Childcare Problems	101.0
Low Motivation*	107.1
Mid Motivation*	108.3
High Motivation*	106.9
All	106.1

* Refer to description and discussion in Chapter 8

As can be seen at Figure 54, a marked variation between the mean entry score performances of several of the sub-groups was found, with the variation from the mean being as high as 5 or more score points on such indicators as low socio-economic background (as indicated by dependency on AUSTUDY as the main source of financial support whilst studying) and Non-English speaking background. To aid in comparison of these data, a bar graph has been prepared, in which the mean score of the whole 1994 scored population is also provided and is shown in black at the right hand side, with sub-populations being individually plotted against the group mean. The resulting graph may be found at Figure 55.

Figure 55 Bar chart depicting T.E.S. performance of selected sub-groups plotted against the overall group mean.



It is most interesting to note that a gender differential of the order of 5.4 mean score points is evident (females 108.4, males 103.0), and

leads to the speculation that this might in some way relate to the undergraduate performance differential between the sexes which has been observed in other studies (Lewis 1994, Cologon 1995a, Dobson & Sharma, 1995). On further investigation it appears, however, that if such a relationship exists it is probably more complex than one might at first suppose. Since a majority of scored entrants were selected into courses for which the primary criterion is score, little or no gender differentiation of score is likely within an individual course. This appears to be the case, as verified by inspecting the gender means for a number of courses selected at random. The distribution of gender among courses, however is not uniform, and therefore a tendency for courses which have a high proportion of female entrants to also be those courses which attracted high scoring applicants and thus produced higher cut-off scores in selection accounts for the differentiation which can be seen in these data.

The significance of this interpretation of the relationship between gender and selection score profiles among the 1994 scored undergraduate entrants at Victoria University of Technology may be more widely applicable. The representation of gender among fields of study and disciplines at Victoria University of Technology is far from unique (DEET, 1995; Dobson and Sharma, 1995). Moreover published data concerning cut-off scores for institutions across the State have, over a number of years, shown cut-off scores for a majority of science and technology courses to be lower than those for the broad spectrum of humanities and commerce studies. The question therefore remains open as to whether a similar pattern of lower scores associated with courses to which the intakes are predominantly male

might be found in higher education institutions across the nation. Were this to be the case, it might provide the basis for better understanding the gender differentials in student performance which, as was noted earlier, have been reported arising from a number of recent studies.

Equally noteworthy are the uniformly low mean entry scores associated with the entrants born outside Australia, the entrants from non-English speaking backgrounds, the entrants who are primarily dependent on Austudy (associated with low socio-economic status) and entrants who reported experiencing childcare difficulties. Whilst these data may also in part be understood in terms of an uneven distribution of members of these sub-groups between higher cut-off and lower cut-off courses, the same patterns can be observed within individual courses, which suggests that members of these groups may have been at a disadvantage in the achievement of their entry scores and their under-representation among the high-scoring entrants accounts for their lower mean scores as a group.

It will be noted that each of the motivation band groupings reported above produced a mean entry score which was above the mean for the group as a whole. It must be remembered that motivation data were available only in relation to the survey respondents, whereas other data related to the whole cohort. The higher entry score mean associated with the survey respondents is directly in line with the higher proportion of females among the respondents. This having been accounted for, the displacement of the motivation data in relation to the mean is not remarkable; little variation between the

bands is evident and they are placed close about the group mean achieved by scored survey respondents (107.6).

It was also observed in the preceding chapter that motivation, though associated with higher achievement in university results, is not significantly linked to any factors other than age, and this result is in line with that finding. Choosing students by score cannot be expected, therefore, to provide any guarantee of motivation.

The fact that respondents who reported high motivation were not significantly differentiated from students in other motivation bands and in fact were not the highest in terms of their mean entry score further confirms the findings reported in the preceding chapter, insofar as it can be observed that although the highly motivated group did not, overall, outperform other groups in their year 12 (VCE) studies, they nevertheless succeeded in doing so at university.

9.5 First Year Results Against Entry Scores

As indicated earlier, it has been considered more helpful to enter into analysis of entrants grouped into ten point bands for the purposes of this review, and therefore the data under discussion here are presented in the same groupings in which they appeared in the bar graph which was reproduced at Figure 53 (above). For reference purposes however, a comprehensive analysis of the academic achievements of entrants at each Tertiary Entry Score level in the range from 60 to 140 has been prepared, may be found at Appendix 8.

Since it is useful for the purposes of this analysis, to review the academic outcomes per se, and to do so for all scored entrants rather

than for respondents alone, it has been determined that this analysis should be based on both progress ratio and weighted average mark data (which does not require the additional information about student goals which has been obtained from surveys) rather than the success index. Although this approach is more cumbersome and presents a less balanced view of outcomes, given that it takes no account of student criteria, it has the advantage that it provides for more ready comparison of the findings reported here with those of like studies undertaken elsewhere (since the indicators are not unlike those used in a range of contemporary studies).

Figure 56. First year academic performance of scored 1994 entrants within ten point T.E.S. bands.

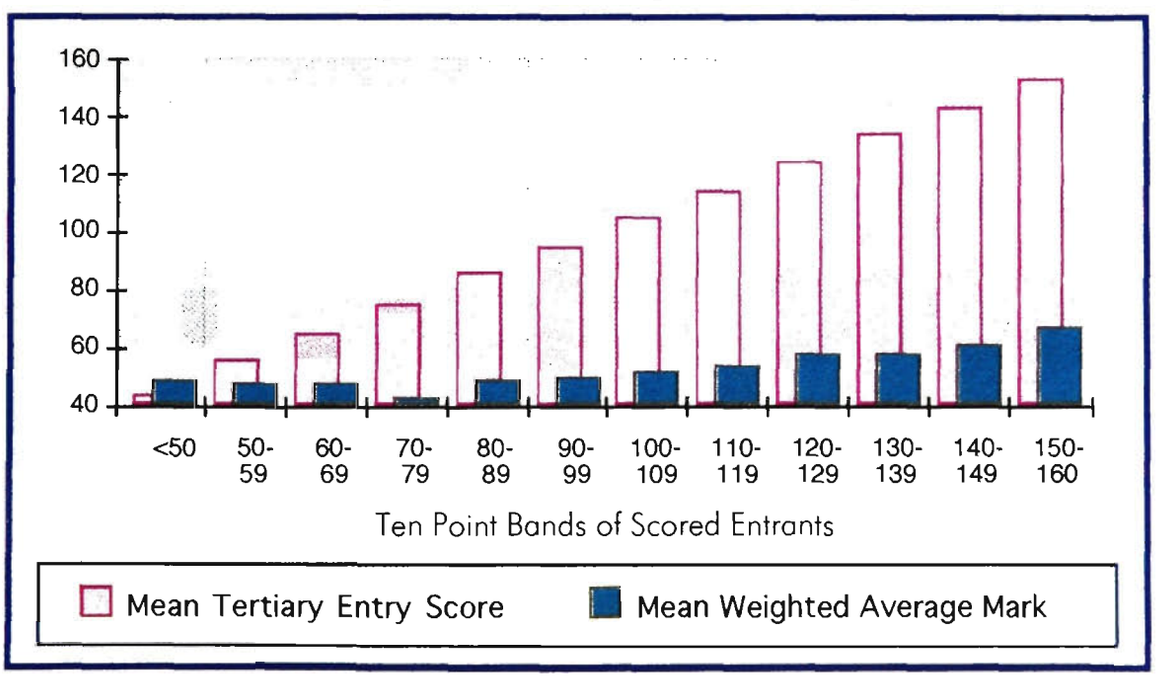
T.E.S.	No of Students	Mean T.E.S.	Mean Progress Ratio	Std. Dev. (Prog Ratio)	Mean Weighted Average Mark	Std. Dev. (W.A.M.)
<50	7	44.1	59.4	30.64	49.0	13.02
50-59	8	55.4	53.7	32.37	47.3	9.90
60-69	35	65.2	55.3	33.43	47.7	15.91
70-79	58	75.1	45.2	38.53	43.0	17.82
80-89	198	85.5	58.2	37.57	48.5	15.75
90-99	317	95.0	62.5	37.42	50.2	15.52
100-109	410	104.5	62.7	35.00	51.3	13.98
110-119	255	114.4	68.3	35.58	53.4	15.81
120-129	228	124.0	78.6	28.21	57.6	13.48
130-139	143	133.9	77.3	28.28	57.9	12.83
140-149	43	143.0	81.8	23.51	60.6	11.67
150-160	11	153.4	95.1	10.36	67.0	9.77

After aggregation of students into ten-point bands according to their entry scores (only scored entrants are included) first year results

have been matched and analysed to produce the data which are presented in the table which is reproduced at Figure 56.

As can be readily observed, there is a marked shift in both the mean progress ratio and the mean weighted average mark as the tertiary entry score increases, showing, as other studies have shown, that there is a connection between high scores within the secondary system as represented in the composite entry score, and subsequent performance in university studies. This is to over-simplify the case, however, as is indicated by two important observations. Firstly, in comparing marks with marks, a variation of the order of 110 marks (70% of the highest possible score of 160) in entry scores is matched by a variation of less than 20% in the mean weighted average marks subsequently achieved. Moreover, the Standard Deviations associated with both the measures of university achievement are high, indicating a wide variation in the scores achieved by students from within each ten-point Tertiary Entry Score band.

Figure 57. Graph (truncated) depicting mean tertiary entry scores overlaid against mean weighted average marks.



A comparison of entry scores to weighted marks is presented graphically at Figure 57, and clearly shows that their inter-relationship is not as strong as may be popularly supposed.

These phenomena can be simply explained: a proportion of entrants with low entry scores achieved high average marks or progress ratios (or both), whilst an equivalent number of higher scoring entrants did not perform so well at university. This is in line with the findings of many such studies over preceding decades (McDonell, 1975; Everett & Robins, 1991) and shows that in this respect at least, little has changed over the intervening time.

Given that the analysis conducted above spans a wide range of scores which, in turn, represent a substantial cross-section of the population of year twelve students, it can be taken as a demonstration that success within higher education is open to a broad spectrum of students, many of whom may have achieved unremarkable results in their previous studies. Perhaps this can be explained, in part, by considering some of the differences which exist between courses at university level and those at secondary level. These are differences which can best be characterised as being higher levels of specialisation and higher levels of scholastic autonomy. In respect of both these differences, different orientations and aptitudes are required, so that students with very particular skills or interests may in some cases perform to a very high standard at university where their efforts produced a more moderate result when faced with the broader demands of the secondary curriculum. Similarly, the less structured tertiary curriculum may be less suitable for students

whose learning style was ideally adapted to the set task and presentation formats more common within school education.

At any rate, the results presented above provide a vindication of the views published by Vernon in 1963 when he contended that the pool of ability (to succeed in higher education studies) if indeed any such 'pool' or set of natural limits existed, lay well beyond the limits of the minority of the population which was served by higher education at that time.

9.6 Pros and Cons of Using Scores

From the point of view of efficiency, the findings of this review suggest that selection by tertiary entry scores may still provide a means, albeit inefficient, for the reduction of attrition, or 'wastage' in higher education. Whether the use of such a blunt instrument continues to be justifiable within a mass higher education system where increasing community pressure for access and equity informs our policy remains an open question. With student progress units of the order of 0.8 reported in a recent study conducted across a number of Victorian institutions (Dobson and Sharma, 1993), the findings of which are echoed by the mean progress ratios of around 80% which have been achieved by the participants in this program (as reported in previous chapters), the efficiency of the higher education system in the 1990s is certainly not less than that which was reported in previous decades, despite a sizeable burden of unfunded growth and a cascade of other challenges faced in reaching this point (Maslen and Slattery, 1994).

In the current context, wherein the profile of higher education has been transformed, and neither the operant conditions nor the imperatives which informed the Murray and Martin reports earlier in the century prevail, it seems likely that alternatives may exist which could match, or exceed, the efficacy of entry scores in achieving the wider ends, as well as the maintenance of tolerable levels of efficiency. For example, methods by which motivation could be measured might, based on previous findings, provide a more effective selection tool which would more reliably enhance academic achievement and completion rates.

There is more to consider than efficiency. Universities, and the communities they serve, have increasingly become concerned with questions of access to higher education (Linke, 1991; Martin, 1994), and the findings of this review point to the need for further research on the question of the effects of score-based selection on the admission of, as well as the potential restriction of options for, some key groups of non-traditional participants such as students from non-English speaking backgrounds, those born outside Australia and those of low socio-economic status. If the lower mean entry scores associated with entrants from these groups can be taken to reflect lower scores amongst the wider pool of applicants from within such groupings, then access to courses with higher cut-off scores would be considerably more remote for these applicants, and their study and career options could be assumed to be correspondingly diminished. This is a matter for concern and further investigation is warranted. However, it falls beyond the scope of this program.

Of equal concern is the lack of strength of entry scores as a basis for prediction of academic achievement at university. As indicated by the standard deviations reproduced at Appendix 8 and verified by reference to individual records within the original data, some entrants whose Tertiary Entry Scores were quite low achieved first year results which were above the group average of the total intake (for reasons which have not been established). This suggests that where more stringent entrance score requirements are imposed (for example in the myriad courses within Victoria University of Technology and other higher education institutions within the State which routinely produce selection cut-off scores well above some of those achieved by the subjects of this analysis), a proportion of very worthy students would be excluded along with others whose prospects of success proved to be less. Moreover, the exclusion of lower scoring school leavers would be likely to have the effect of reducing access for individuals from several non-traditional groups, unless accompanied by alternative mechanisms for selection of these applicants, in recognition of other factors which may lead to their academic success.

Whilst this analysis was confined to a single cohort, and it must be noted that the form within which year twelve results for tertiary selection are now provided is that of a percentile rather than a score (ie the tertiary entrance rank), the review of data did not produce any evidence to suggest that the findings reported here would differ substantially from those which may arise from a comparable analysis of subsequent cohorts.

SECTION FIVE: Comparing Background and Performance

Chapter 10:

Alternative Ways to Select for Success

Following on from an analysis of selections based on score, it seems reasonable to take stock of the wider situation and to acknowledge that considered approaches to selection are not solely dependent upon score based selection, and probably never have been.

In observing that there were 1,713 students among the 1994 undergraduate entrants to Victoria University of Technology for whom year 12 composite scores (Tertiary Entry Scores) were available at the time of selection, by implication it could be understood that no scores were available for the remaining 1,220 entrants. Therefore decisions about selection in respect of some 42% of the undergraduate intake must have been made on some other basis.

In fact, the proportion of the intake for whom the critical decisions about admission were made on some basis other than score is certainly higher than 42%, and is probably higher than 50%. Within Victoria University of Technology in the 1993/4 selection round, as in other higher education institutions within Australia, there were a number of courses for which score was not a consideration in selection and admission decisions. These include a range of specialised offerings such as the degree courses in Performance

Studies or Traditional Chinese Medicine, where auditions, interviews, folios or other such procedures form the sole basis of selection decisions. Needless to say a proportion of the students admitted to such courses were among those for whom scores were available, even though they were not, in the event, used in selection. A check of the data in respect of several of these courses selected at random indicated that in each, around half of the entrants were scored, confirming the view that the overall number of entrants whose selection was based on score is probably less than 50%. Although the proportions undoubtedly vary between institutions, many of the general principles are common. Even in institutions where score based selection accounts for the majority of selection decisions, the proportion of non-score based decisions could be assumed to be substantial.

Among those entrants for whom scores were a factor in selection decisions, are the members of a further group who were admitted to courses for which the entry criteria include a range of factors other than score. In fact since the implementation of the VCE it has been customary throughout the State for courses to specify a number of secondary criteria which will be applied around the cut-off, and it is expected as a matter of selection policy throughout the State, that the weighting applied to these secondary criteria (in courses purporting to select principally by score), will be such as to account for 20 to 40% of selection outcomes (Victorian Tertiary Admissions Centre, 1995).

Taken as a whole, then, one might say that of the total amount of undergraduate student selection which takes place on an annual

basis, it is likely that a majority of decisions are made partially or fully on a basis other than score. This point is not widely recognised, and the media attention paid to the annually published course cut-off scores reflects and reinforces public perception.

10.1 When Selection also means Exclusion

Over a number of decades, increasing provision has been made by many universities, for paths to entry which do not require applicants to adhere to the conventional routes of admission via matriculation examinations within the secondary system. The mechanisms through which this is effected are frequently termed alternative mode entry or *alternative category entry,* and it is the latter term which is employed at Victoria University of Technology.

The conventional path to admission at Victoria University of Technology (termed *normal entry*) requires successful completion of an approved year 12 course of study. Several formats of year twelve studies or TAFE programs which are not scored are deemed equivalent to VCE studies for these purposes. Only a small number of students admitted under the University's normal entry provisions, however, are not scored. Thus, approximately three quarters of the 42% of unscored entrants (or 31.6%) who commenced undergraduate courses at the University in 1994, are those who were deemed eligible under the University's alternative category entry scheme.

The University is required by the Australian Federal Government, under the terms of its funding agreement, to apply quotas to all local student intakes into its undergraduate award courses. Thus the total

number of students admitted in all categories must be adjusted to be in line with funded quotas. This means that taking in an additional non-scored student in a given admission round results in the displacement of a scored student who might otherwise have been made an offer of admission. Similarly, admitting a particular non-scored student may well mean denying entry to another in order to meet externally imposed quotas. In this respect selection decisions are, by implication, also exclusion decisions.

In the current context, wherein the selection for success is the philosophy underpinning undergraduate admissions (and this is explicitly stated in the undergraduate admissions policies published in the Victoria University of Technology annual handbooks), the achievement of balance between entrants admitted under the various categories of admission is a matter of importance.

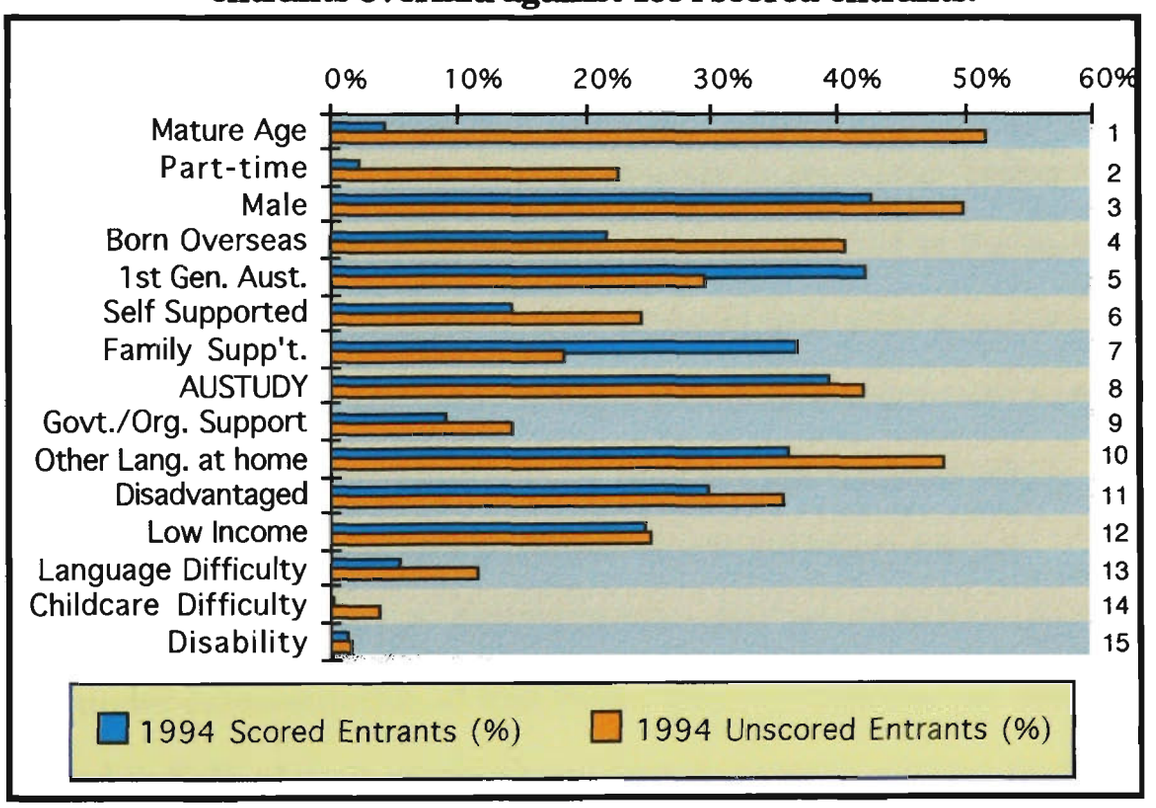
10.2 Equity Considerations - Population Profiles

The composition of the different groups of entrants who are admitted to the University under various categories of admission is a central issue which must be considered in determining the relationship between scored and unscored entrants, and in ascribing value and effect to score based selection decisions as against decisions made on other grounds.

It goes without saying that the population profiles of those admitted under the various categories will differ. For example, the alternative category for mature age applicants exists explicitly to provide an avenue to admission for a group who would otherwise be less well

represented among entrants. Since the majority of scored entrants, as observed above, will have qualified for admission under normal rules (rather than alternative category provisions) it is to be expected that a high proportion of scored entrants would be under 21 and conversely, that a significant number of unscored entrants would be mature age. A number of other such population differences can be anticipated, and these can be seen at Figure 58 in a chart which provides a visual comparison of fifteen-point profiles of the 1994 scored and unscored entrants.

Figure 58. Chart depicting 15-point profiles of the 1994 unscored entrants overlaid against 1994 scored entrants.



Recalling that the second largest category of basis of admission for the entrants who were the target group for the program was the mature age category (ref Chapter 5, Figure 8), the disparity between the scored and unscored groups profiled at Figure 58 is as expected, along with the high proportion of part-time students who were

unscored (since a significant number of mature age students are also part-time). However whilst a small proportion of those entering the university on the basis of completed secondary schooling were over 21 (in 1994 this was 8.6% of school leavers) an almost equally small proportion of 1994 entrants who were over 21 were scored (10.7%).

The fifteen elements included in the profiles, as described in Chapter 5, represent minority groups, a number of which are associated with disadvantage or with student backgrounds which can be regarded as non-traditional. It is therefore revealing that, quite apart from the predictable preponderance of mature age students among the unscored entrants, there is a substantially greater number of all but two of the remaining minority groups among the unscored group profiled at Figure 58. The two categories which are under- rather than over-represented in the unscored entrants profiled at Figure 58 are first generation Australians and students primarily dependent upon family support, the latter being a grouping which is associated with higher socio-economic status (ie they are the students whose families can assist them to a sufficient extent that they are not primarily dependent upon AUSTUDY or other government support). The under-representation of first generation Australians can also be viewed in light of their relatively privileged status as against those born outside Australia, who are over-represented among unscored entrants by a considerably greater margin. An analysis of the profile of unscored entrants admitted on the basis of successful completion of a course equivalent to year 12 (a sub-group of the 1994 unscored entrants group profiled above) shows similarly high proportions of

disadvantaged and non-traditional groups (although the number of mature age and part-time students in this sub-group is only 23% and 6.7% respectively).

It is possible to conclude from this analysis that, relatively speaking, unscored entrants were a less privileged group, and, in this respect, the alternative category entry mechanism in 1994 aided the purpose of increasing the representation of socio-economically and/or culturally disadvantaged students among the intake. However, it is important to note that even the unscored entrants who were admitted via normal entry mechanisms were composed of proportions of the minority groups associated with underprivilege comparable to those found among the unscored group as a whole. This indicates that score based entry to the University in 1994 was, to some extent, reserved for the (relatively) privileged, and points to the exclusion of significant numbers of underprivileged and/or non-traditional students as a function, albeit incidental, of score based selection decisions.

It has been suggested that the achievement of equity within the higher education sector should be measured according to the relative match (or its absence) between the profile of the population in the community and the nation, and the profile of the student body (Martin, 1994). Performance indicators for the achievement of equity targets have been developed along these lines.

Whilst estimation of the performance of an institution against reference criteria requires careful review of the catchment area

feeding the institution, and of the participation rates across a wide spectrum, it is nevertheless possible to extrapolate from a comparison of profiles within the institution. In this context, profiling of rejected applicants would provide a more complete picture, however such data are not currently available to the program, and the exercise falls outside its limits.

Despite the limited scope of the profile of scoring undertaken above and within the preceding chapter, it seems clear that the considerable use of selection procedures beyond those which are score based forms an important component of selection for increased representation of non-traditional and disadvantaged groups. To what extent the trends which emerged above in respect of the 1994 undergraduate intake at Victoria University of Technology can be regarded as indicative of the relationship between score based and non-score based selection decisions in the wider system is not clear. However none of the available evidence could be taken as indicating that the results are unique.

10.3 Concord between Equity and Excellence

A further issue of some importance is that of the impact of selection decisions, particularly in relation to the subsequent progress of commencing students. It is not enough to admit students if the nature of teaching and other support is insufficient for their needs; they will duly depart with few benefits, and the cost to them directly and to the community indirectly will have made the whole exercise one of negative impact.

Based on a functional analysis of the variable profile of an intake, one might assume that the performance of specific groups might be inversely proportional to the extent of their representation among the student population. That is to say, if one assumes that the top 20% of a particular sub-population which we might term 'group A' finds its way into higher education, but of a second group in the community, group B, only the highest achieving 10% enrol in university and if one also assumes that ability is distributed normally between and within both groups, one might reasonably expect the under-represented group B within the university to perform at a level comparable to the upper 50% of group A, and therefore at a considerably higher level than the performance of group A overall. Such a notion provides a useful theoretical model, but presents serious limitations in any real-world application.

In actuality, any two groups such as the notional groups A and B described above would differ in some crucial respects which might be expected to be reflected in the distribution of abilities among them either because of the operation of circumstances upon them or because of predilections or tendencies which caused them to gravitate to or at least meet criteria for membership of the group. This is not necessarily to say that the relative ability of groups in aggregate (and in abstract) varies markedly, but rather, that the mix of aptitudes between them may vary much as it does between the individuals of which they are composed. Whether differing predilections are the cause or the result of varying orientations in the apparent talents of different groups, or its cause is not a matter of concern here. The

principle which underlies equity policies is surely that groups should be treated equally and afforded equal opportunities, rather than that groups should be assumed to be the same, or made to be the same.

To provide a more concrete example, an assumption underlying some approaches to measurement of equity achievements by universities is that rural and metropolitan populations should be equally (proportionally) represented among higher education students. However populations are not static and in some areas it may be the case that a number of individuals finding themselves equipped with more practical and less bookish (though not inherently less valuable) talents may have chosen to move away from city life towards the liberating practicality of a rural existence. Conversely others, finding themselves less ideally suited to the solitude, space and physical demands within farming communities may have struck out for the buzz and wit and hubbub of metropolitan centres, aspiring to study, work and trade in skills of a more inherently academic nature. Thus the tyranny of distance may not be the only reason why course promotions in remote and outlying areas yield a less satisfying return in terms of applications lodged or, for that matter, offers of admission accepted. To argue thus is not to detract from the view that educational provision for those appropriately inclined and endowed is of equal importance for those whose circumstances place them at a distance from university campuses.

Similarly, there are some group differences which mitigate in other ways against equal presence and/or performance in higher education. Obvious examples of such differences are language

barriers, wherein difficulties in communication make it less likely that certain individuals and groups will succeed in making themselves aware of opportunities within higher education, less likely that they will attain the confidence in their own abilities necessary for impetus towards application for admission, less likely that they will successfully negotiate the complexities of the application and selection process, and less likely that they will adapt and compete to the extent of their intellectual powers if and when they do sit alongside native speaking scholars. Cultural heritage is likewise a factor which may work in a variety of ways, some subtle and invisible, against participation in equal numbers or equal terms of members of groups whose native gifts may be objectively no less than those of groups well represented among university student populations. A third factor, economic disadvantage, may also be linked to obstacles, barriers and disincentives in a variety of ways. It must also be recognised that frequently this trio of issues is interdependent, and as a consequence it is not just possible but probable that a person who lies within one group may also lie within one or both of the other groups.

Despite the various ways in which real world situations may differ from those of the simple theoretical constructs which underpin some of the contemporaneous notions of equity (Moodie, 1995) there is nevertheless some value in bearing in mind that under-represented groups may in some cases appear to perform well precisely because they represent only the upper reaches of the normal distribution of ability within the population from which they are drawn.

The point of connection between theory and application in this instance would appear to be centred on the ability of the university to adapt its environment, its education provision (facilities, delivery modes and styles etc) and even its curricula to provide adequately and appropriately for the particular needs of groups in the community who may traditionally have been under represented in our lecture theatres and laboratories.

Perhaps a more sophisticated approach to the establishment of equity targets and the measurement of institutional performance against such targets will ultimately be required.

It makes no sense to exhort universities (or other educational institutions for that matter) to fill their halls with students whose needs they poorly understand and are ill-equipped and unprepared to adequately meet. Mutual disenchantment and dissatisfaction, not to mention inefficiency and perceived failure, are the likely consequence. A more enlightened approach to measurement might entail comparisons between the performance of an institution in recruiting equal proportions of a range of identifiable sub-populations and their ability to teach and assess in such a way as to produce overall academic outcomes which could be seen to relate to the performance of other groups in a way which was reasonable in light of the sub-group cohort size (or rather, proportion of the wider population).

Such a process could be regarded as measuring the extent to which universities were successful in adapting curricula and teaching

methods to meet the diverse needs of the various identifiable groups in the communities which they are paid to serve. Rather than focussing upon inputs alone, with an apparent nonchalance about the subsequent fates of different sub-populations, institutions might then have the tools with which to manage a process of movement toward achievement of genuinely equitable outcomes.

It is an assumption underlying the discussion herein that equity and quality (or excellence, as it is termed within the mission statements of Victoria University of Technology) are not incompatible but rather, can each be achieved more readily in the presence of the other. It has also been an implicit assumption that the attention of public policy remains focussed on equity precisely because of an awareness within and beyond political arenas, of shortcomings in the match between rhetoric and reality. In commencing a process of review of alternatives and examination of the effects of past practices within the analyses reported in this thesis it is necessary to acknowledge the extent of efforts towards achievement of equity goals within the institution in which this study was conducted and in so doing, to acknowledge that it is in large measure the progress towards achievement of such goals that makes an analysis of this type possible. In other words it is because the University has succeeded in breaking ground that the vantage point has been reached from which it is possible to see how much further there is to go.

It has been demonstrated within several of the previous chapters that the profile of the undergraduate student intakes at Victoria University of Technology in 1993 and 1994 was highly diverse and that

the size of numerous identifiable underprivileged, disadvantaged and/or non-traditional groups in relation to the total is significant. In the earlier part of this chapter, it was established that such groups were disproportionately represented among non-scored entrants in 1994.

In the first instance and as a prelude to an analysis of the success indices achieved by a number of very specific sub-groups, a review of the relative success of the unscored 1994 entrants was undertaken.

10.4 Outcomes for Unscored Entrants

Although it has been possible to assess the composition of the total cohort of undergraduate entrants for 1994 in relation to the available data on entry scores, this has been done by comparing marks with scores using data provided from the University's administrative records. In considering the relative success of groups of students who were subject to selection decisions on different groups (ie scored and unscored) it is necessary to limit the review to those students for whom data are available to allow calculation of success indices. Therefore this analysis draws upon students who are participating in the program, divides them into two groups, scored and unscored, and draws comparisons between the indices achieved by those groups.

Of the 1,556 participants in 1994, 917 students were scored, regardless of whether those scores were the sole or even partial basis of the selection decisions resulting in them being made offers of admission to their respective courses. The remaining 639 participants from 1994 were not scored.

The table at Figure 59 provides an overview of the relative achievements of the scored and unscored participants in 1994, as against their combined indices.

Figure 59. Cross-tabulation of success indices against scored and unscored 1994 participants.

	Number of Students	Mean Success Index	Standard Deviation
1994 Scored Participants	917	47.9	23.98
1994 Unscored Participants	639	50.6	23.58
1994 Participants (all)	1,556	49.0	23.85

It must, first, be acknowledged that the variations between the mean success indices achieved by the scored and unscored participants when grouped as they appear in the above table are not large. However they are large enough to be noteworthy, and they are both surprising and, perhaps, reassuring.

It should be noted that the trends produced in relation to the mean progress ratio and mean weighted average mark, though not included above, followed the same trend as the data reproduced and, in fact, showed greater differentiation between the scored and unscored groups, the differentiation becoming more muted by the application of referencing to students' goals and aims in the production of the index.

It would be tempting to move rapidly to an interpretation of the results of this review based on the preceding analysis, thereby concluding that the University was more than adequately successful

in selecting appropriate students by means other than score, and in adjusting its educational provision to enable such students to overcome the effects of disadvantage, where they occurred, to succeed in larger measure than students who reached the University via more conventional routes. Indeed the view that selection of non-scored applicants was successful might be reinforced by the observation that the standard deviation of the success index for the unscored participants was slightly smaller than that for the scored group, indicating a slightly narrower spread of results and in turn signifying greater accuracy and/or reliability of predictions about outcomes implicit within selection decisions. It is likely that there is some basis to these observations. Upon reflection, however, there are other factors which should be considered.

In the first instance, it must be remembered that for over a decade, institutions operated within two competing sets of federally imposed quotas: overall course quotas and school-leaver quotas. The consequence of this was that, of necessity, a proportion of places in the annual intake into each undergraduate course were effectively reserved for school leavers, and only the remaining places were available for mature-age or articulating students. Although the definition of 'school leaver' for the purposes of application of the second quota had been made a little more broad by 1994 (so that, for example, students articulating into higher education via a TAFE course could in some instances be counted towards the school leaver quotas), the effect upon selection was still significant. One consequence of this was that course selection officers were pressed to

take as many school leavers as possible, even to the extent of erring on the side of generosity in selection decisions appertaining to scored entrants (most or all of whom were, by definition, school leavers) whilst exercising comparatively higher levels of caution and even conservatism in their offers to applicants in other categories. Before leaping to the conclusion that the selection mechanisms applied to unscored entrants were highly effective, it is appropriate to remember that the effectiveness of selection procedures applied to scored entrants, the group with which the comparison at Figure 59 was made, may have been limited or adversely affected by the operation of the dual quota system as it applied in 1994.

One way to check the relative effectiveness of selection decisions as they applied to scored and unscored entrants without risk that the operation of school leaver quotas might obscure or distort the results would be to compare the achievements of scored and unscored school leavers among the 1994 participants. A table which presents an analysis of the success of the school leaver sub-group within the 1994 participants (in the same format as that which was viewed previously for the 1994 participants as a whole) has been prepared and included as Figure 60 (below).

The data reproduced at Figure 60 show an opposite trend to that which was seen at Figure 59, again showing only relatively small differences between the mean success index of the scored and unscored school leavers, but in this instance showing a marginally higher performance (with accompanying lower standard deviation) on the part of scored school leaver entrants.

Figure 60. Cross-tabulation of success indices against scored and unscored school leavers from among the 1994 participants.

	Number of Students	Mean Success Index	Standard Deviation
1994 Scored School-Leaver Participants	827	48.0	24.16
1994 Unscored School-Leaver Participants	254	46.3	24.38
1994 School-Leaver Participants (all)	1,081	47.6	24.22

This can be taken to indicate that selection decisions made concerning school leavers, where scores were not available, were comparable though marginally less effective in the context of selection for success, than the counterpart decisions where scores were available.

A further factor which should be considered in interpreting the data presented at Figure 59 is the fact that, as was previously ascertained (and as described in Chapter 8), there are links between age, motivation and success. Since a majority of mature age entrants are unscored (88.1% in 1994) their higher motivation and associated higher achievements may have further contributed to the result observed at Figure 59. Further analysis of the data reveals that more than half of the unscored participants shown at Figure 59 were mature age (355 students or 55.6%) and that their mean success index was 52.9 with a standard deviation of 23.57. Thus it is reasonable to conclude that the trend observed at Figure 59 can be

attributed in the main to the presence of highly motivated mature age entrants among the unscored participants.

Although the above analyses provide a picture of the outcomes for groups selected on different grounds, they are perhaps most interesting for what they tell us about the comparability of the achievements of the different groups within the cohort of entrants.

10.5 Glimpses of the Future

To say that the performance of unscored entrants may have been boosted by a sub-group such as unscored mature age entrants to be, overall, better than that of scored entrants overall is not to detract from the significance of the original result.

Just as high scoring applicants may be selected because selection officers are persuaded that such scores may be taken as indicators of potential to succeed in the course(s) in question, so too other factors may be considered in a like way in respect of unscored applicants.

In a few cases it may be that selection officers, perceiving a link between motivation and performance, may contrive to select for motivation directly, and may test for this in a variety of ways using interviews or other selection tests. It is probably, however, that in many cases tests for motivation are less direct, and that other factors such as achievements in the professional arena, which equally arise from the motivation of the individual, are the basis of judgements on the part of selection officers. One might suppose that such direct and indirect forces are also at work in respect of the selection decisions

where scores are available. That is to say, a student whose application for admission is accompanied by a high score may be assumed to have achieved that score by the application of both motivation and ability and so, in selecting for score a selection officer may to some extent (albeit indirectly) also select for motivation.

It seems reasonable to conclude from the preceding analyses (ref. Figures 59 and 60) that at least in this instance, alternative selection strategies have been applied successfully to enable the recruitment of unscored students with an overall efficiency at least comparable to that which was possible using the more conventional techniques of score-based selection.

Given that it has also been shown that under-privileged, disadvantaged and/or non-traditional groups were significantly better represented among unscored entrants, one might also observe that the results presented above are a measure not only of the effectiveness of selection per se, but of the match between selection methods, the provision of support and the adequate design and application of teaching methods to enable an unconventional unscored population to compete on equal terms, overall, with scored entrants.

This analysis leads to speculation on two fronts: that the University may have positioned itself to successfully admit and educate still greater proportions of non-traditional entrants and that the strategies for selection where score is not available may be regarded not merely as a reasonably effective alternative when scores are not available,

but as a platform upon which to base a mainstream operation within the foreseeable future.

It is with the latter prospect in mind that the initial aims of this program were formed, and the objects of providing new insights or increased understanding and tools for review and application within selection in the future seem to be of increased value in light of the results of this component of the program.

It is reassuring in light of the preceding analysis, to note that during the course of the program, the widely accepted methods of selection within the State of Victoria have undergone a transition such that from 1995 onwards it is expected that all undergraduate courses within the State will take at least some account of factors other than score in framing selection decisions. This principally operates within the 'middle band' (a name coined to refer to the group of applicants who on the basis of score are neither clearly 'in' [selected] nor clearly 'out' [rejected] and about whom more critical and refined judgements might be made) and all courses publish a range of criteria other than score which may be used to inform judgements about middle band selection.

It is, therefore, suggested that the objects of this program may be viewed as more timely now than they appeared in 1991, when the program was first conceived.

Chapter 11:

Sample Groups for Comparative Purposes

The analysis undertaken in preceding chapters was seen as a necessary part of the process of developing a sufficient understanding of the data collected for the purposes of production of a comparative indexing model which might provide an instrument for policy analysis and selection review.

The exploratory work reported in Sections 3 and 4 was largely that which was suggested by the data, and entailed the following up of leads or seeming anomalies in aspects of the data prior to more active analysis. In fact a great deal more follow-up work was required than can, for reasons of space and relevance, be reported in this thesis, much of it leading to corrections of omissions or anomalies within the data and arising from idiosyncratic differences in the way data were managed by the University administration in the years 1993 and 1994 (the University having moved from several subsidiary databases to a new single platform during this time).

In a number of instances explorations of the data were conducted in such a way as to provide for comparison between the cohorts on a range of criteria. Although data have generally been first analysed for the cohorts separately, where no marked differences emerged between the cohorts the data have been concatenated for the purpose of presentation of results in the thesis, with analysis and discussion

of combined data being presented. The notable exception to this related to the self assessed disadvantage data discussed in Chapter 7. Since no other noteworthy divergence between the 1993 and 1994 cohorts has been observed, in the main analyses reported within this section the cohorts are, for the most part, combined and treated as one data set.

A further aspect of the exploratory work undertaken during the developmental stages of the program was the opportunities it provided for trialing of the success index, resulting in several iterations of minor refinements of the algorithm to provide for greater balance between the effects of each of the various forms of input data used in the calculation. The more refined algorithm so achieved has been applied uniformly throughout this thesis.

Having arrived at the point wherein a broad understanding of the data has been attained and significant issues have been explored, the process of purposeful identification of groups who might be extracted and examined for comparative purposes was commenced.

11.1 Underpinning the Sampling Process

In the early stages of the program, a series of factors and combinations of factors which might usefully be explored and compared was identified. It was concluded that in order that findings based on data about a given group of students selected according to specific criteria be a basis for generalisation, the groups should be of the order of twenty-five students or more. This was principally so that the effects of individual variations would not have a large impact on

the group mean since the contribution of an individual to the mean would not exceed the estimated measurement error given a notional 95%+ confidence level (Porter, 1988), and also for consistency with the benchmark for statistical significance ($p = 0.05$, $n \geq 25$), as reported in Chapter 6.

During the latter part of 1993, it became clear that the response rate, distribution and diversity of the population of entrants was such as to provide a sufficient base of data for the assembly of more sample groups than were envisaged at the outset of the program. At this point further formative work was done in order to build upon the scope of the exercise and to make more adequate use of the data which were becoming available. The collection of a further set of data of comparable size and spread in 1994 confirmed that an extended analysis of the kind envisaged would be viable.

A further consideration in the identification of sample groups was the elimination of sampling errors which might be introduced as a result of the interaction of sampling criteria. An example of this would be a group selected on the basis of extensive work experience prior to the commencement of their studies who, not surprisingly might happen also to be mostly highly motivated mature age students. In such a case any conclusions about the outcomes achieved by the group would have to be carefully considered in light of the group composition before any associations might be identified, or any causal links inferred, between the base sampling criteria and the (apparently) related outcome (James, Mulaik & Brett, 1982).

The elimination of sampling error involving the interaction of criteria is purportedly achieved in many quantitative studies by the application of linear regression, where the action of secondary characteristics (ie not the characteristics which were the target of the sampling criteria) is compensated for by the application of a mathematical procedure. Such a procedure was not applied to the data under review in this program.

There are several reasons for explicitly rejecting conventional regression as a part of the process of treatment of data for this program, some of them philosophical and some practical. The philosophical reasons were outlined in Section 2 (pp 44-48) and therefore are not repeated here. A practical reason which relates directly to the process of identification of sample groups is that it was not merely individual background characteristics which were to be the focus of the analysis and the application of comparative indexing procedures. On the contrary, an underlying purpose of the program is to develop and trial procedures for examining combinations and constellations of characteristics which might produce meaningful outcomes and provide new insights into the relationship between background and success.

The example given earlier illustrates the way in which linked characteristics might interact to produce data which might be open to misinterpretation. The conventional argument is that, to avoid this, one should simplify the analysis by applying a statistical procedure with the object of eliminating all but one cause and one effect. However, to do so is to assume that cause and effect are in fact

simple. On the contrary, the assumption underlying this program is that whereas to a limited extent simple correlations between background characteristics and performance at university have been identified in preceding decades, it is combinations of factors which might provide insights which will prove useful for selection in the future. In other words it is important that one is in a position to see whether certain characteristics enhance, or detract from, the performance of mature age students, and to begin to understand how various characteristics interact, rather than to continue to endeavour to view them all in isolation.

A number of approaches to the identification of combinations of factors which might correlate with academic achievement have arisen in other studies which were the subject of review in the second chapter. These include cluster analysis (Entwistle & Wilson, 1977; Everitt, 1974), analysis for attributes of success (Small, 1966) and predictive attribute analysis (Macnaughton-Smith 1965). These measures, however, have not proven highly effective in the identification of strong links, including in their application to the relationship between background and success, as demonstrated in the study by Small. This program, however, trials a different approach.

To achieve the somewhat demanding aim of comparing multiple characteristics within untreated data, the sampling and indexing method was applied in concert with the profiling procedures used throughout the program thus far, to enable the interpretations of initial results to lead to findings, in which the interaction of sample

criteria with incidental characteristics has been appropriately considered.

11.2 The Selection of Characteristics for Profiling

Having established (ref. Chapter 5) that the pool of respondents as a whole was a representative sample of the target group, at this point in the program, options for the extraction of sub-groups or samples from among the participants were considered. It must be acknowledged that the data available within the program are such that a large number of possible combinations of background characteristics would be possible, and it was well beyond the scope of the program to conduct an exhaustive study of all possible combinations. Because of this, sets of sampling criteria have been selected, both to illustrate the way in which background may relate to success, and in so doing, to trial the procedures based both on the success index and the *comparative matrix* methodology by applying them to a diverse selection of sample groups.

Although it is acknowledged that the list of sampling criteria was neither systematically assembled nor exhaustive, the selection of background characteristics for sampling was nevertheless informed and purposeful. During the early phases of the program, preliminary analyses were conducted, and these led subsequently to the parallel explorations reported in Chapters 5 to 9 inclusive. Associations observed during early work with the data (and reported in preceding chapters) provided the basis not only for the exploratory work on specific background characteristics, but also provided some hints of

the directions of investigation which might most fruitfully be adopted at this stage of the program. In particular, early insights suggested that combinations of related and unrelated experience and combinations of age and experience should be included in the sampling criteria. In addition to these, some of the criteria which were examined in previous chapters (eg self-assessed disadvantage) have been included in order to capitalise upon the greater depth of understanding gained from earlier explorations of the data.

As well as being guided by emerging trends as described above, the criteria for sample groups were chosen on the basis that the groups should vary considerably, covering a wide sweep and that the criteria sets should in some cases include combinations of factors which might provide targeted and specific information. The matrix approach was applied primarily to trial the process and with a view to demonstrating the wider applicability of the technique, rather than as an attempt to exhaustively explore the application of comparative matrices. The criteria were therefore chosen for their potential to contrast and highlight several unusual or non-traditional combinations of background characteristics and to compare these with some of the more conventional or traditional groups within cohorts of entrants.

Initially, for the purposes of comparison of the relative value of background as an indicator of potential for success in higher education, twelve groups with (in some cases) overlapping membership were identified as warranting investigation. These groups were each selected for two variables. After further review the

list was refined and extended to include the following sixteen sets of criteria:

1. Participants who were school leavers (VCE) with passes in year 12 subjects predominantly in same/similar subjects to those being studied at undergraduate level (eg several subjects from the same field of study, some in the same discipline).

2. Participants who were school leavers (VCE) with passes in subjects predominantly unrelated to those being studied at undergraduate level (eg most or all subjects at year 12 in other fields of study, not in the same discipline group/s).

3. Participants who had incomplete secondary education (year 11 or less) with two or more years work experience directly relevant to the vocational focus or discipline mix of the tertiary course being attempted.

4. Participants who had incomplete secondary education (year 11 or less) with two or more years work experience unrelated to the vocation/discipline focus of the course.

5. Participants who had passes in year 12 subjects predominantly in same/similar subjects to those being studied at undergraduate level, plus two to five years directly relevant work experience.

6. Mature age participants with five or more years of work experience related to the field or discipline of the course being undertaken.

7. Mature age participants with less than a single year of related work experience but five or more years of work experience in an area unrelated to the field or discipline of the course being taken.

8. Participants with previous studies unrelated to their course, but with two or more years work experience related to the field of discipline of the course being taken.

9. Participants with between two and five years related work experience and also between two and five years unrelated work experience.

10. Participants with five or more years related work experience as well as five or more years unrelated work experience

11. Participants without any experience or previous study related to the vocational or discipline focus of the current course.

12. Participants who are experiencing one or more type of disadvantage (eg socio-economic, language).

13. Participants in the age range from 25 to 35.

14. Participants of age 36 and above.

15. Participants who have been independent for two or more years and are supporting themselves whilst undertaking studies.

16. Participants who are under 25 years and who are studying on a part-time basis.

A further two groups, based upon the receipt of credit for previous study, were initially considered. However data for the identification of

these groups have proven to be insufficiently accurate to provide a sound basis for analysis, so work has not proceeded in that area.

As can be seen, several of the sub groups which were envisaged had also warranted some investigation in preceding chapters as part of the review and analysis of data. Most notably these are groups twelve, thirteen and fourteen and, indirectly, groups six, seven and sixteen (which combine age with other criteria). The inclusion of those groups in the trial matrix of equivalence for the program was nevertheless considered desirable. With the survey of data complete, it was concluded that the sixteen sample groups as indicated above, though far from exhaustive, would provide an adequate basis for initial exploration of the comparative matrix approach.

The majority of the sixteen groups were selected according to criteria which clearly identified them as non-traditional entrants, however the frequency of occurrence of the combinations of sampling characteristics varied, (as can be seen at Figure 62). The group which can be regarded as entirely conventional is group 1, the members of which both qualify for normal entry under the Victoria University of Technology Admission Regulations (Victoria University of Technology, 1994) and also meet relevant course entry prerequisites. To a lesser extent, group 5 can be regarded as conventional, since this group met the most common criterion for mature age entry which in turn is the largest of the Alternative Categories of admission. To varying degrees and in different ways, each of the remaining fourteen sample groups can be regarded as having been composed of non-traditional entrants.

It should be noted that in a few cases, particular members of the population may have belonged to more than one of the sample groups. In most instances this was not possible, because many of the criteria were mutually exclusive, as is clearly the case with group 1 as against group 2 for example, and equally with group 6 as against group 7. In other cases there may be some overlap, as in the case of group 6, where it can be seen that a number of members of the group may also have been members of group 3 (in fact approximately 35%), since the criteria were partially compatible. Other cases of overlap included group 12, since some students reporting one or more type of difficulty/disadvantage may have been present in each of the other fifteen groups and also the age range groups (13, 14 and 16) whose members may have been present in different proportions among other groups according to their criteria.

Just as some participants may have been present in more than one of the sample groups, since the list of sampling criteria was not exhaustive, there were other participants who were not included in any of the sample groups. The non-selected participants simply contributed (along with those who had been selected) to the body of the 'all participants' group which was used as a quasi- control or reference group. Upon examination of the data, it has been ascertained that a minority of participants (592 participants or 19.2%) were not represented in any of the sample groups. In order to assess the choice of selection criteria for the sample groups and, in particular, to ascertain whether any key criteria had been omitted, a profile of non-selected participants was prepared, and is included in

both table and graph forms at Appendix 9 (see Figures 102 and 103). It was concluded from this analysis that a sufficient mix of characteristics was represented among the sixteen groups already identified, to provide an adequate test of the matrix approach, as well as to yield interesting and/or potentially useful data in relation to a number of non-traditional groups of entrants.

To provide a cross-reference for the analyses which follow, an abbreviated summary of the selection criteria for the sample groups is provided in table form at Figure 61 (below).

Figure 61. Abbreviated key to the criteria for the sixteen trial sample groups.

Sample Group Number	Brief Summary/Description of Selected Participants
1	School leavers with related prior studies.
2	School leavers with unrelated prior studies.
3	Incomplete Secondary with ≥2 yrs relevant wk. exp.
4	Incomplete Secondary with ≥2 yrs unrelated wk. exp.
5	Related prior studies (yr 12) plus 2 to 5 yrs relevant wk. exp.
6	Mature age with ≥5 yrs relevant wk. exp.
7	Mature age with <1 yr related exp. but ≥5 yrs unrelated wk. exp.
8	Unrelated prior studies but ≥2 yrs relevant work experience.
9	2 to 5 yrs related wk. exp. plus 2 to 5 yrs unrelated wk. exp.
10	≥5 yrs related wk. exp. plus ≥5 yrs unrelated wk. exp.
11	No related prior studies or work experience.
12	One or more type of difficulty/disadvantage.
13	Age range from 25 to 35 yrs.
14	Age range of 36 and above.
15	Independent ≥2 yrs and self supporting (including Austudy).
16	Age range <25 yrs and studying part-time.

NB: For efficiency, sample groups have henceforth been referred to by number, particularly in charts and tables, however the above key has not been reproduced on each such occasion and should be referred to here.

11.3 The Size of Sample Groups

The next question which presented itself was that of the viability of the sample groups. Initially, the number of participants available for inclusion within each sample group had to be established. An overview of the available data against each of the sample criteria listed above is presented in the table which appears at Figure 62.

Figure 62. Overview of available data on the sixteen sample groups.

Sample Group No.	Number of Respondents 1993	No of Participants 1993	Number of Respondents 1994	No of Participants 1994	Total Sample (1993 + 1994)
1	461	458	424	420	878
2	153	153	181	178	331
3	59	59	44	44	103
4	37	37	16	16	53
5	55	55	57	57	112
6	103	102	88	88	190
7	62	61	66	65	126
8	111	111	79	79	190
9	33	33	26	26	59
10	40	39	29	29	68
11	143	142	171	168	310
12	224	222	946	938	1,160
13	162	159	149	149	308
14	65	64	47	47	111
15	296	293	366	361	654
16	68	66	81	77	143

NB: Abbreviated descriptions of the Sample Groups may be found at Figure 61 on page 238.

On the basis of the data represented at Figure 62, it has been concluded that all sixteen of the proposed sample groups were viable, there being significantly greater than 25 in all groups, with greater than 100 in thirteen of the groups. All groups, excepting sample

group 4, also had more than 25 members in both years of the program, thus enabling cross-checking and comparison of the cohorts separately. Although group 4 did not have the desirable viable group size in both years, its viability overall made it worth retaining.

11.4 The Composition of Sample Groups

Having established the sixteen basic groups which were to form the basis of the comparative indexing process, the master database application developed for the program was codified to allow instant retrieval of the members of one or more of the target groups in any chosen combination. Similarly the database was extended to provide a codified access field for the fifteen profiling characteristics which had previously been used to assess the composition of various sub-groups as well as to establish that the participating sample was representative of the total level one higher education intakes in 1993 and 1994.

Using the extended data access and retrieval facility, profiles of each of the sample groups have been generated to give an overview of their composition.

A further step in the review of profile data and survey responses in relation to the sample groups is the comparison of the sample groups with the group of participants from which they are drawn. One should recognise that, having been selected according to specific criteria, the sample groups are by definition not representative of the profile of the participants as a whole.

For each sample group it is possible to view the fifteen profile characteristics within three groups; those which relate directly to the sample criteria for the group, those which relate indirectly to the sample criteria, and those which are incidental to the criteria. It is important for the purposes of this study, to be confident that the sample groups are representative in relation to factors not connected with the sampling criteria, so that the comparisons are not obscured by incidental occurrences.

One would expect a group of students who each had five years or more of work experience to be over 21, and therefore an age profile different from that of the participants as a whole would not cause concern. Similarly, such a group might be expected to include a higher number of part-time, mature age and self supported students, as well as a greater number of students experiencing childcare difficulties. All these variations in the profile of a sample group are related to the sample criteria and can be accepted.

On the other hand, variations in the profile of a sample group which are neither directly nor indirectly connected to the sample criteria warrant investigation. Figure 63 provides data sets for each of the sample groups showing the number within each group who matched each of the fifteen minority indicators or elements upon which profiles have previously been constructed (ref Chapter 5). These data provide a general picture of the composition of each of the sample groups, as well as revealing those cases where a majority of members of a particular group show up on one or more of the fifteen minority indicators.

Figure 63. Distribution of sample group members against the fifteen profiling indicators.

	<<<← Sample Groups →>>>															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
A	25	27	102	52	27	190	126	143	30	61	91	388	308	111	410	88
B	9	5	63	19	10	107	46	76	16	37	24	122	135	69	175	143
C	366	99	44	21	50	81	48	78	30	36	98	483	135	46	298	61
D	186	113	27	16	23	67	51	55	10	19	144	512	151	48	271	37
E	337	113	27	15	32	40	23	47	20	14	90	315	55	10	172	54
F	116	30	58	15	33	97	39	91	25	34	31	179	123	49	265	70
G	368	134	12	12	36	27	16	30	14	11	101	255	49	15	0	18
H	335	141	19	19	38	45	53	48	19	14	151	645	112	21	389	40
I	59	26	14	7	5	21	18	21	1	9	27	81	24	26	0	15
J	224	121	7	10	22	30	34	28	12	6	149	571	107	28	265	39
K	266	123	37	19	35	65	65	57	17	23	139	1,160	158	45	333	51
L	223	79	26	12	29	45	44	45	16	15	87	858	97	28	243	41
M	42	52	4	2	5	12	17	7	1	2	62	322	59	11	106	10
N	3	3	10	7	3	16	15	7	1	7	4	70	37	15	23	1
O	10	3	4	1	0	6	0	5	0	3	3	53	5	3	13	2
(All)	878	331	103	53	112	190	126	190	59	68	310	1,160	308	111	654	143

KEY TO PROFILING INDICATORS:

A: Mature Age	F: Self Supported	K: Disadvantaged
B: Part-time	G: Family Supported	L: Low Income
C: Male	H: Austudy/Abstudy`	M: Language Difficulty
D: Born Overseas	I: Gov't/Org Support	N: Childcare Difficulty
E: 1st Gen. Australian	J: Other Lang. at home	O: Disability

NB: Abbreviated descriptions of the Sample Groups may be found at Figure 61 on page 238.

To assist in the review of the composition of the sample groups, the number within each of the fifteen minority elements has been converted to a percentage, and compared to the corresponding percentage for the participants as a whole. The differences arising from this comparison (ie sample group % minus whole group %) have been provided at Figure 64.

Figure 64. Comparison between sample group profiles and combined participants profile (Δ%).

	<<<← Sample Groups →>>>															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
A	-23%	-17%	73%	73%	-1%	74%	74%	50%	25%	64%	4%	8%	74%	74%	37%	36%
B	-10%	-10%	50%	25%	-2%	45%	25%	29%	16%	43%	-4%	-1%	33%	51%	16%	89%
C	2%	-9%	3%	0%	5%	3%	-1%	2%	12%	14%	-8%	2%	5%	2%	6%	3%
D	-9%	4%	-4%	0%	-9%	5%	11%	-1%	-13%	-2%	17%	14%	19%	13%	12%	-4%
E	4%	0%	-8%	-6%	-6%	-13%	-16%	-9%	0%	-14%	-5%	-7%	-16%	-25%	-8%	4%
F	-5%	-10%	38%	10%	11%	32%	12%	29%	24%	31%	-9%	-3%	21%	26%	22%	30%
G	9%	7%	-22%	-11%	-1%	-19%	-21%	-18%	-10%	-17%	-1%	-11%	-17%	-20%	-33%	-21%
H	-3%	2%	-22%	-5%	-7%	-17%	1%	-16%	-9%	-20%	8%	15%	-5%	-22%	19%	-13%
I	-1%	1%	6%	6%	-3%	4%	7%	4%	-6%	6%	1%	0%	1%	16%	-7%	3%
J	-7%	4%	-26%	-14%	-13%	-17%	-5%	-18%	-12%	-24%	16%	17%	2%	-7%	8%	-5%
K	-7%	0%	-2%	-2%	-6%	-3%	14%	-8%	-9%	-4%	7%	62%	14%	3%	13%	-2%
L	-2%	-4%	-3%	-5%	-2%	-4%	7%	-4%	-1%	-6%	0%	46%	4%	-3%	9%	1%
M	-6%	5%	-7%	-7%	-6%	-4%	3%	-7%	-9%	-7%	10%	17%	9%	-1%	6%	-3%
N	-2%	-1%	7%	11%	0%	6%	10%	1%	-1%	8%	-1%	4%	10%	11%	1%	-2%
O	-1%	-1%	2%	0%	-2%	1%	-2%	1%	-2%	3%	-1%	3%	0%	1%	0%	0%

KEY TO PROFILING INDICATORS:

A: Mature Age	F: Self Supported	K: Disadvantaged
B: Part-time	G: Family Supported	L: Low Income
C: Male	H: Austudy/Abstudy`	M: Language Difficulty
D: Born Overseas	I: Gov't/Org Support	N: Childcare Difficulty
E: 1st Gen. Australian	J: Other Lang. at home	O: Disability

NB: Abbreviated descriptions of the Sample Groups may be found at Figure 61 on page 238.

Previously within the thesis, profiles have been provided in graphic form as that seemed best to suit the nature of the discussions then taking place. Although profile charts have been deemed too bulky to be of benefit in relation to the analysis reported at this point, graphed profiles of each the sixteen Sample Groups are, nevertheless, of interest, and have, therefore, been included at Appendix 9.

As indicated previously, the logic which would lead to the application of regression to each of the samples is regarded as circular. Clearly links between the various indicators and the criterion for a given group exist, especially where the group has been sampled by not one but a set of criteria. It is contended that in a majority of cases links to both primary (directly associated with the sample criteria) and secondary (indirectly linked to the sampling criteria) factors are among the legitimate defining features of the group and therefore not something which should be statistically eliminated. Instead, attention has been paid to those cases where the connection between profile variations and sampling criteria is unclear or at least not immediately evident. Particular attention has been paid to those groups where the number of members is below 100, where the performance of an individual can conceivably have an effect larger than ±0.04 on the group mean indices.

As can be seen at Figure 64 (above), substantial profile variations are evident in characteristics which relate directly to the sample criteria. In relation to characteristics which do not relate to the sample criteria, fluctuations are generally not significant (ie $[\Delta\% \times \Delta m] \div [100 \times n] < 0.4$, where n is the sample group size and Δm is the difference between the WAM of participants meeting the relevant criterion and the WAM of all participants). On the other hand, significant variations (of the order of 10%) have occurred in relation to gender (groups 2, 9, 10 and 11) and ethnicity, defined in terms of those born outside Australia and/or who speak a language other than English at home (groups 1, 7, 9, 11, 13 and 14).

The gender bias here, too, is interesting, in that, in a majority of cases (including two of the four groups cited as having a significant differentiation) the bias is toward males, in effect counteracting the overall original sampling bias towards females (see Chapter 5). Where a negative bias exists, however, (groups 2 and 11) the original gender sampling trend is accentuated. In this case, there is a common criterion for the two groups in which it occurs: that of prior studies which are unrelated to the discipline being studied now. A gender analysis of 'mostly unrelated' responses to question 2 and '1–5 years' responses to questions 3 and 4 in the survey results however, shows only a 2% bias on question 2 and a 1% bias on question 4. This result suggests that the gender bias is not related to the 'unrelated' study or employment backgrounds of sample groups two and eleven, and can, therefore, be assumed to have arisen coincidentally, or to be the product of some phenomenon not evident in the available data. As such, these variations may be indicative of wider phenomena in social, education and employment trends as they relate to gender. Whilst it is important that such characteristics of gender be borne in mind when reviewing the outcomes for such groups, their presence in the data was not seen as compromising the validity of sampling nor detracting from the proposed analysis.

The distribution of ethnicity (based on profiling elements D, E and J; born overseas, 1st generation Australian and other language at home respectively) is the main area, other than gender, where several of the sample groups diverge from the overall profile of the participants, wherein a direct or indirect link to the sampling criteria is not

apparent. Again, these data do not appear to have been caused by profile variations among the responses to individual survey questions (which are of a lesser order and are for the most part not significant, being below 5%), but can be regarded as being associated with the coincidence of factors isolated by the relevant sample group selection criteria. As was the case with gender differentiation, these variations may be considered to be indicative of wider economic, cultural and social phenomena, and as warranting careful consideration throughout analysis, but not warranting isolation or elimination.

The remaining profile variations at Figure 64 have been identified as bearing a primary or secondary relationship to the selection criteria for the respective sample group, and thus have been viewed as affirming or ratifying the selection/sampling process rather than calling group composition into question or requiring further investigation or amplification. On the basis of the above analysis, an investigation and comparison of the indices of success of the sample groups was commenced.

Overall, therefore, it can be said that the 15-indicator profiles of the sample groups showed few variations from the profile of all participants which were not either directly or indirectly linked to the sampling criteria. However where divergence has occurred this was noted for further investigation and consideration in subsequent analyses.

11.5 Cross-Fertilisation of Ideas

As can be seen among the list of sample group criteria listed earlier in the chapter, a number of the sampling procedures have the effect of isolating those individuals among the group of participants who have some combination of related and unrelated studies or employment in their background. These criteria were chosen because they illustrate one kind of non-traditional educational pathway. One might assume that the entrants whose history has been subjected to one or more changes of direction in such a way (particularly when the commencement of the current course itself represents such a change) would be hampered in their ability to adapt and to understand material which bears little semblance to their previously acquired skill, knowledge, or conceptual bases.

Indeed, many higher education courses have specified one or more prerequisite studies without which applicants will not be considered for admission. This in some cases rests upon an underlying assumption that a change of specialisation at tertiary level will be difficult if not impossible to achieve. In many cases prerequisite studies are based on the principle of presumed knowledge, so that the curriculum for first year studies picks up a thread of knowledge from studies at the secondary level, and students who have not participated at year twelve may find themselves at a disadvantage, with considerable ground to catch up. Even where prerequisite studies are not a feature of the entry criteria, the discipline focus of some courses is relatively narrow and opportunities to blend studies from divergent fields are limited. In such courses the extent to which subject content

can be linked to (or expressed and explained in terms of) other fields of knowledge is limited.

Given that prerequisite studies apply only to school leavers, and all courses admit at least some entrants in other categories (the most common being mature age) at least some of whom have not materially satisfied prerequisites before entry, one might assume that the performance of such students overall would serve to illustrate the difficulties which they faced. This is especially so in cases where limited supplementary or bridging options are provided for students whose background knowledge is less than that presumed by their teachers.

Although in many instances students admitted without having satisfied prerequisite requirements in the conventional way could be expected to be operating at something of a deficit, one might alternatively suppose that particular advantages would accrue to individuals whose experience is more broad, and who are thus able to see connections between related ideas which are not so readily visible to those whose experience lies principally within one field or discipline. It has been suggested that special insights and advantages may be available to the individual who is positioned at a vantage point from which more than one perspective or conceptual framework may be seen and applied (Koestler, 1964; de Bono, 1994). Such ideas seem at odds with the conventional approach to course design and student selection for undergraduate courses wherein specialisations are frequently encouraged and sometimes required

and where course structures in some fields are confined and narrowly focussed.

The composition of a number of the sample groups for this program among the sixteen summarised at Figure 61 is such as to provide opportunities to subject some of the prevailing wisdom concerning selection and prerequisites to a new kind of test, in which one type of non-traditional or unconventional path into higher education can be viewed and compared with others.

The significance of this aspect of the analysis of comparative indices goes beyond reflections about the nature of ideas, given that strategic thinking about higher education for the State and the Nation places considerable emphasis upon the role of the higher education sector in retraining and re-skilling members of a workforce which has been overtaken by the technological revolution (Office of Higher Education, 1992).

The analyses which are described in the following chapter, leading to the production and exploration of comparative matrices, were undertaken with these foregoing considerations in mind.

Chapter 12:

The Outcomes Matrices

Throughout the thesis, various data concerning the backgrounds and self-assessment of students who participated in the program have been compared and, in a number of instances, various measures of the outcomes or academic achievements of particular groups, have been used as a reference within the processes of exploration and analysis. These procedures provided the necessary formative work for the development of the proposed index procedure which was one of the initial aims of the program.

At this point in the program, aspects of the comparative approach trialed during earlier investigation of the data were used to develop the comparative index of outcomes, as they related to each of the sample groups identified and discussed in the preceding chapter. The application of the indexing procedure is described in this chapter, and the sixteen part *success matrix* which resulted from these trials is presented and described.

12.1 Ways of looking at Aggregated Data

The sixteen sample groups are comprised of program participants who elected to join the program, completed and returned surveys and released enrolment and results data for use in the research, and who subsequently completed sufficient studies in their first academic year to obtain at least one subject result. As part of the preparation of data, enrolment, results and survey response data on the participants have

been loaded into specially designed computer applications (software) which serve two primary purposes: the calculation of a composite success index which draws upon and combines enrolment, results and self-assessment data and facilitates the access, retrieval and interrogation of data against wide ranging criteria (see description and specifications at Appendix 4). The applications have been coded to provide for immediate cross tabulation and calculation of mean indices and standard deviations, for the sixteen sample groups.

Figure 65. Table showing academic progress and success indices for each of the sixteen sample groups.

Sample Group No.	Number of Students	Mean Progress Ratio	Mean W.A.M.	Mean Success Index	Std Dev. Success Index
1	878	76.7	56.8	50.0	23.68
2	331	72.9	56.0	48.5	25.40
3	103	93.2	66.7	59.8	23.02
4	53	91.5	67.3	59.2	23.33
5	112	79.6	59.1	53.1	25.56
6	190	88.4	65.7	57.9	24.35
7	126	91.7	68.7	61.3	21.21
8	190	87.3	64.9	58.3	23.16
9	59	89.1	65.3	59.9	20.23
10	68	88.2	66.5	54.1	25.95
11	310	73.5	56.8	47.9	25.12
12	1,160	76.8	57.8	48.2	23.99
13	308	88.3	66.3	58.4	22.64
14	111	90.3	65.8	55.3	24.83
15	654	83.9	62.4	54.2	23.18
16	143	78.0	57.3	46.4	24.00
All Participants	3,086	79.1	58.7	51.3	23.75

NB: Abbreviated descriptions of the Sample Groups may be found at Figure 61 on page 238.

Drawing upon the coded database applications used for storage and interrogation of the range of data collected within the program, a set of indices for each of the sample groups has been compiled. These data are included above as Figure 65. For reference purposes, mean progress ratio and weighted average mark data are also provided.

In preceding chapters, profile data and various measures of outcomes, including the success indices, have been presented for the purposes of analysis and discussion. The presentation styles have most frequently entailed the use of text-based tabulations of corresponding data and/or computer generated two dimensional bar graphs and column graphs in a variety of styles. At one point, a line chart based on conventional median (or other measure of central tendency) and spread (including range or variance) techniques was used to represent mean and standard deviation data derived from progress ratio and weighted average mark data (ref. Chapter 8, Figure 51), a format akin to that often described as the box plot.

Although it contains little more than the minimum information required for analysis of outcomes for the sample groups, the table reproduced above may be somewhat difficult to read and interpret, and does not facilitate comparison between the groups. A more visually accessible presentation medium was therefore sought.

12.2 Comparative Reference Using Box Plots

Given the difficulties presented in working with rich information such as that presented at Figure 65 (above), it was considered most appropriate to collapse mean and standard deviation data into a

single graphical representation. Because of its ability to combine both kinds of data, it has consequently been decided to adapt the box plot approach used previously, in line with current theories of data design (Chambers et al, 1983). In this way, composite data drawn from performance indices on members of the sample groups are presented in a format wherein horizontal bars are used to represent the position of the means against the horizontal axis, while a series of vertical columns (one for each group) are positioned about the means to indicate the span and displacement of the standard deviation.

There are several advantages which make the box plot format most suitable for the data in question. Chief among these is the fact that the format is one which allows the standard deviation to be appropriately featured. If the mean success index achieved by a particular group is relatively high then one might, in the absence of other data, be inclined to assume that the factors which members of that group have in common could be regarded as indicative of good prospects of success, perhaps even regarding the result as having predictive value. If the standard deviation for the group is shown to be large, however, it can be assumed that the constituent data are widely spread, and the predictive value of the group can be seen to be correspondingly less.

A practical example of the use of the standard deviation would be the differentiation of two groups, each comprised of three students and having a mean success index of 54.0. On the basis of this information one might assume that the performance of the two groups was comparable, and that the criteria by which they were selected were of

equal value as predictors of success. However the first group has a standard deviation of 2.9 (based on individual indices of 50, 55 and 57) and the second a standard deviation of 38.0 (based on individual indices of 3, 65 and 94) and the groups are not at all alike.

The above example, although simplistic, illustrates the point that a high standard deviation is associated with a wide spread of results and a correspondingly poor predictive value of the data for the group in question. A lower standard deviation, on the other hand, signals greater conformity within the group, suggesting greater predictive value. Thus a presentation format where mean and standard deviation size and standard deviation displacement (about the mean) data might be viewed simultaneously was considered desirable.

There are several possible approaches to preparation of material for presentation in the box plot format (Chambers et al, 1983) and it is appropriate to briefly describe here the procedure adopted.

Simple box plots may in some cases merely centre the standard deviation about the mean and, in situations where a normal distribution can be presumed, this may be acceptable. In the case of the data presented in the table at Figure 65 however, it has been ascertained that the distribution is uneven and so a technique has been adopted which will indicate the degree of spread in each direction above and below the mean, whilst retaining the integrity of the standard deviation size as a measure in itself.

This has been achieved by calculating separate standard deviations for those members of a group who are below the mean and those

members who are at or above the mean. The standard deviation for the group as a whole has then been apportioned above and below the mean in proportion to the ratio between the standard deviations of the upper (at or above the mean) and lower (below the mean) portions of the group. This means that although the presence of the standard deviation on the resulting chart gives an indication of its size and consequently the extent of spread of the data represented, its position is equally important in signifying the ambit of spread each way.

The formulae applied were thus:

$$\text{Lower plot point of St.Dev} = \text{Group Mean} - \left\{ \frac{\text{St.Dev,Lower} \quad X \quad \text{St.Dev,WholeGroup}}{\text{St.Dev Lower} + \text{St.Dev Upper}} \right\}$$

and:

$$\text{Upper plot point of St.Dev} = \text{Group Mean} + \left\{ \frac{\text{St.Dev,Upper} \quad X \quad \text{St.Dev,WholeGroup}}{\text{St.Dev Lower} + \text{St.Dev Upper}} \right\}$$

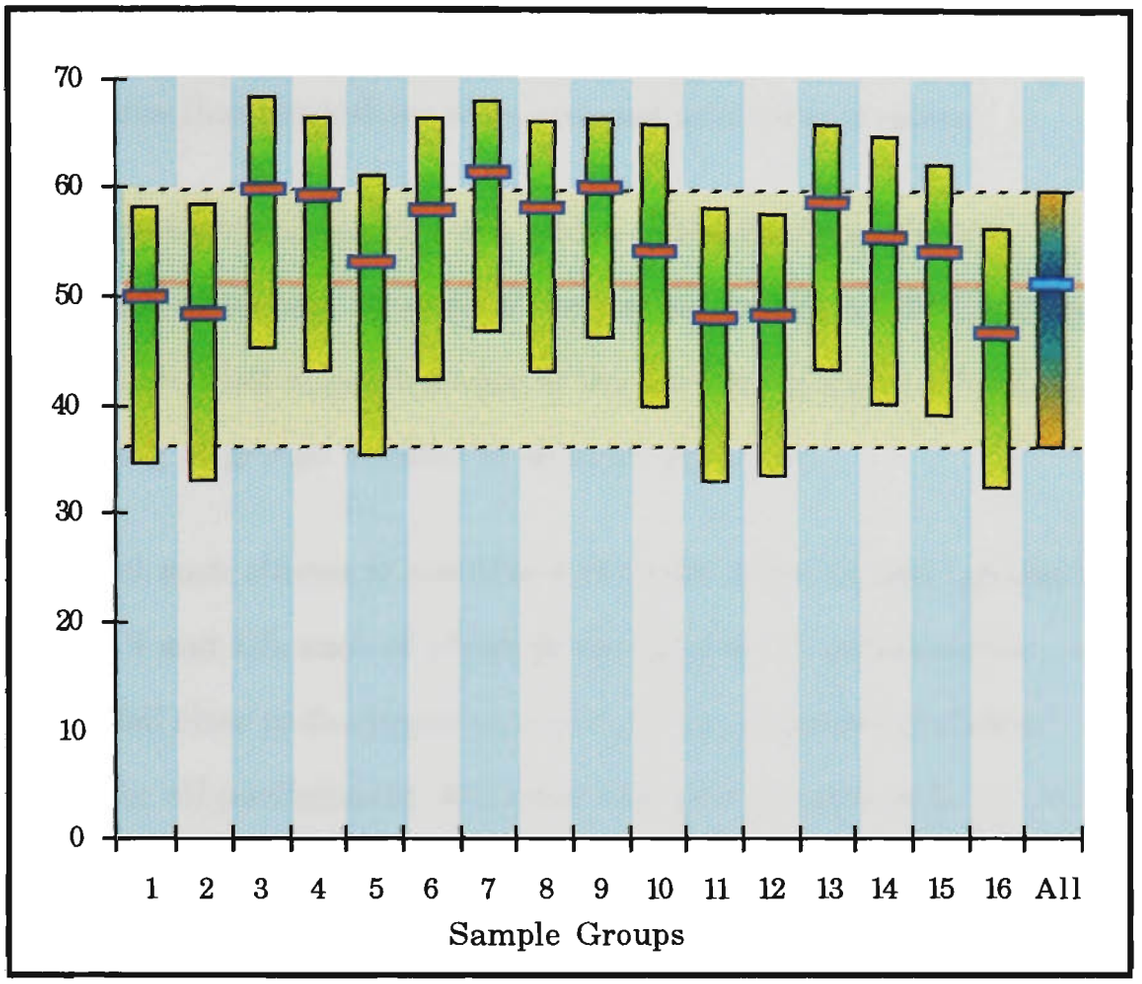
and were applied in a spreadsheet application environment to the data from Figure 65, together with the separate means for those at or above the mean and below the mean for each of the sixteen sample groups (these latter data being drawn from the master data application and added to the spreadsheet).

Having thus calculated lower and upper spread limits for the standard deviations, the indices were plotted using the charting facility in the Microsoft Excel environment, and were subsequently exported into an object oriented graphics computing environment where they were expanded into the box plot format, converted into a condensed scale for presentation here and given colour.

The resulting graph, appearing at Figure 66, presents the data on all sixteen sample groups, as well as the index for all participants, within

a single chart which is accompanied by a condensed description of the selection criteria used to establish the sample groups.

Figure 66. Graphical representation of the comparative matrix of success indices for the sixteen trial sample groups.



KEY TO SAMPLE GROUPS:

1	School leavers with related prior studies.
2	School leavers with unrelated prior studies.
3	Incomplete Secondary with ≥2 yrs relevant wk. exp.
4	Incomplete Secondary with ≥2 yrs unrelated wk. exp.
5	Related prior studies (yr 12) plus 2 to 5 yrs relevant wk. exp.
6	Mature Age with ≥5 yrs relevant wk. exp.
7	Mature Age with <1 yr related exp. but ≥5 yrs unrelated wk. exp.
8	Unrelated prior studies but ≥2 yrs relevant work experience.
9	2 to 5 yrs related wk. exp. plus 2 to 5 yrs unrelated wk. exp.
10	≥5 yrs related wk. exp. plus ≥5 yrs unrelated wk. exp.
11	No related prior studies or work experience.
12	One or more type of difficulty/disadvantage.
13	Age range from 25 to 35 yrs.
14	Age range of 36 and above.
15	Independent ≥2 yrs and self supporting (including Austudy).
16	Age range <25 yrs and studying part-time.
All	All 3,086 students participating in the research program.

12.3 Examining the Visual Measures

It became apparent once the success matrix was presented in box plot configuration that progress could be made a good deal more rapidly towards understanding the data than had been possible when the data were viewed in text format. Moreover it was considerably easier to observe that the indices were grouped into three clusters.

When background shading was added to the chart so that the indicators of success for each of the sixteen groups could be viewed against the plotted performance of the participants as a whole, the clustering of groups became even more apparent.

The first such cluster is comprised of seven of the groups (groups 3, 4, 6, 7, 8, 9 and 13), each of which produced a mean success index which fell close to the upper extremity of the standard deviation range for all participants. A further four groups (groups 5, 10, 14 and 15) were clustered around the middle of the upper standard deviation band for all participants, and the remaining five (groups 1, 2, 11, 12 and 16) fall just below the mean for the overall group.

It is notable that a majority of the sample groups performed at above the average achievement levels of the participants as a whole, with almost half of the groups clustered near the top of the scale, approximately ten points above the overall mean. It is also interesting to observe that the spread of means is higher than was observed when contrasting groups on a range of criteria earlier in the program, even exceeding the range from lowest to highest mean weighted average mark which fell between students reporting low motivation and those

in the upper band (high motivation) of the three tiered motivation index (ref Chapter 8, Figure 50).

As well as observing the distribution of mean success indices, some attention must be paid to the size and displacement of the standard deviations. In each case, the standard deviation of the members of a given group below the mean exceeded that of members of the same group at or above the mean, so that at Figure 66, the downwards span of the standard distribution columns is invariably greater than that of the upwards span. This mirrors the success distribution pattern of the participants as a whole and can be explained in terms of the presence of some students whose performance is markedly below that of the group in question and whose departures from the mean success indices are not matched or counterbalanced by errant high performers in the group above the mean. This trend is confirmed by an inspection of the populations at the upper and lower extremities, wherein of the whole population of 3,086 participants, there were 276 whose success indices were less than or equal to 10, whereas there were only 12 whose indices were greater than or equal to 90.

In inspecting the sizes of the standard deviations, it must be acknowledged that all are relatively large, thus indicating that the levels of success amongst the members of all of the sample groups vary across a wide range. Conspicuous by their absence are tightly knit groups whose performance falls highly predictably within a narrow range. In this respect, the results of this study mirror those of previous studies which have sought to identify predictors of

success, wherein those correlations which have been found have been moderate at best.

Despite the less than dramatic variations in the standard deviation values for the sample groups, it is nevertheless worth observing that the standard deviations follow a pattern alike to the clustering of the means. In fact, six of the seven groups clustered around the top of the range have smaller standard deviations than the value for all participants, indicating that their achievements were not only higher, but more uniformly so. Conversely, all but one of the groups with means clustered below the mean for all participants, have standard deviations which exceed the value for all participants, signifying that the sampling criteria for such groups have no predictive value, the indices of the members being more erratically distributed than for the cohort overall.

12.4 Interpretation and Investigation

The questions which first present themselves in respect of the results presented above relate to the cause(s) of the differential performances of the groups and to the relationship between these phenomena and other trends identified in the preceding analyses.

In the preceding chapter, the composition of the sample groups was surveyed, and age and gender were among the factors which were investigated. Whilst age variations were generally in line with expectations, given sampling criteria for the various groups, no such ready explanation was available in respect of the gender variations. Since, in an earlier chapter, an apparent link was found between age

and motivation, a comparison between the age, motivation and gender composition of the groups at this point was a necessary part of the process of analysis of the success matrix at Figure 66. The aim of this procedure was to determine the extent to which variations in the performance of the sample groups might be attributed to the different gender, age or motivation composition of the groups.

It must be acknowledged that to the extent that age represented a primary defining characteristic in respect of groups 6, 7, 13, 14 and 16 and a secondary characteristic for groups such as 9, 10 and 15, any contribution it may have made to outcomes plotted in the success matrix can be viewed as legitimately linked to the sample criteria. Similarly, if one assumes that gender variations are consequent upon (rather than coincidental to) the sampling criteria, then any effect of gender could similarly be regarded as linked to the sample criteria.

To the extent that motivation is aligned with age, it too may be related to the sample criteria for a number of the groups, and any attribution of outcomes to the effects of motivation would nevertheless not detract from the presumption of a link between outcomes and the sample criteria.

What is at issue here is the question as to what may be viewed as the superordinate cause of the markedly different (from the whole-group outcomes) performance of a number of the sample groups. If performance varies most in relation to factors such as gender, age or motivation, then to select groups on another criterion which is linked to one of the aforementioned factors would be to disengage from the

point of origin and to move towards an indirect, rather than direct, bearing on the issue of success and its causes and correlates.

Equally, it is possible that the criteria used to select participants for some of the sample groups (or, for that matter, other criteria not examined in this study), possess closer causal links to success than the more general factors such as age, gender and motivation. In this case, it would be reasonable to assume that the alignment of success with more general factors is a consequence of the links between these factors and the more narrow sampling criteria for the high performing sample groups, rather than the other way around.

It has previously been observed that the magnitude of an effect may be expected to be greatest when one moves closer to its cause. Thus, if the performance differential of a given group exceeds that associated with one of the factors with which it is linked, then the sample criteria for that group can be viewed as closer to the point of origin or cause of the effect observed as having been associated with the said linked factor, and in fact, as having contributed to that association.

For example, if a sample group selected on a primary criterion such as work experience (and, as an indirectly linked factor, found to be of a mean age greater than the whole group) achieves a higher mean success index than would be expected on the basis of their higher mean age alone, it would be reasonable to conclude that their presence among the wider category of older students was lifting the mean performance of that category and was in fact its partial, if not sole, cause.

Before giving practical application to these somewhat abstract observations in the examination and interpretation of the success matrix, the various data appertaining to age, motivation and gender as they apply to the sample groups were gathered together, and a condensed summary is provided herein at Figure 67.

Figure 67. Table showing age, motivation and gender data for the sixteen sample groups.

Sample Group No.	Number of Students	Mean Age at Entry	Mean Motivation Index	Percentage of Females	Percentage of Males
1	878	17.9	34.5	58.3	41.7
2	331	18.3	33.0	70.1	29.9
3	103	33.5	36.8	57.3	42.7
4	53	31.6	38.2	60.4	39.6
5	112	19.7	34.7	55.4	44.6
6	190	32.0	36.9	57.4	42.6
7	126	30.8	37.9	61.9	38.1
8	190	28.0	37.5	58.9	41.1
9	59	21.2	36.9	49.2	50.8
10	68	33.6	39.3	47.1	52.9
11	310	20.8	33.7	68.4	31.6
12	1,160	21.1	34.9	58.4	41.6
13	308	29.1	37.5	56.2	43.8
14	111	41.1	36.5	58.6	41.4
15	654	23.5	37.0	54.4	45.6
16	143	20.9	35.8	57.3	42.7
All Females	1,873	20.2	35.1	100.0	0.0
All Males	1,213	20.7	34.7	0.0	100.0
All Participants	3,086	20.4	34.9	60.7	39.3

NB: Abbreviated descriptions of the Sample Groups may be found at Figure 66 (above), as well as in the table at Figure 61 on page 238.

Upon viewing the data collected together in the above table, it is apparent that the seven groups whose performance was clustered in

the upper range on the success matrix (3, 4, 6, 7, 8, 9 & 13) all have mean ages above that of the participants overall, most by margins of the order of ten years. When these groups are combined, the mean age at entry is 28.9 years. Similarly, the mean motivation index for each of the seven groups is above that of the participants overall and, taken as a single group, their mean motivation index is 37.2.

The second cluster of four groups a little above the mean (5, 10, 14 & 15) shows a mean age at entry above the mean overall (24.8 years), but the spread of mean ages varies more widely, and one of the groups (Sample Group 5) has a lower mean age at entry than that for the participants overall. As was the case for the first cluster, the mean motivation indices achieved by a majority of the groups in the second cluster were higher than the overall group, but again the means were scattered and Group 5 was below the mean for the participants overall. The mean motivation index combined for the members of the groups within the second cluster (when taken as a single body) was 34.8.

The overall means of age at entry and motivation index for the third cluster, those grouped a little below the mean success index of the participants overall (1, 2, 11, 12 & 16), were very close to those for the participants overall (20.0 years and 34.8 respectively), as was the gender distribution of the third cluster (59.4% females and 40.6% males). The data on age, motivation and gender for the combined members of each of the three clusters of sample groups are presented in the table at Figure 68.

Figure 68. Table showing age, motivation and gender data for the three performance-based clusters of sample groups.

	Number of Students	Mean Age at Entry	Mean Motivation Index	Females (%)	Males (%)
First Cluster of Groups (Grps 3, 4, 6, 7, 8, 9 & 13)	518	28.9	37.2	57.3	42.7
Second Cluster of Groups (Grps 5, 10, 14 & 15)	839	24.8	36.7	55.4	44.6
Third Cluster of Groups (Grps 1, 2, 11, 12 & 16)	2,108	20.0	34.8	59.4	40.6
All Participants	3,086	20.4	34.9	60.7	39.3

Interestingly, the overall gender distributions of the first and second clusters did not show an over-representation of females. This is not what one might expect, given that the performance of the first and second clusters was above the overall group average, and, as shown at Figure 69 (below), the mean success index of females is also above the group average. On the contrary, in the overall gender balance of the first cluster, females were under-represented by 3.4% and in the second cluster, they were under-represented by 5.3%.

Figure 69. Table showing academic progress and success indices by gender.

	Number of Students	Mean Progress Ratio	Mean W.A.M.	Mean Success Index	Std Dev. Success Index
Female Participants	1,873	83.2	60.4	54.6	22.15
Male Participants	1,213	72.8	56.2	46.3	25.19
All Participants	3,086	79.1	58.7	51.3	23.75

It is not difficult to dismiss any suggestion that the differential performance of the sample groups might be attributable to gender. In fact an obverse observation seems more appropriate, in that were the possible effects of gender to have been compensated for by statistical adjustment, the breadth of the departure of the first two clusters from the mean of all participants would have been greater rather than less than that shown at Figure 68.

The question remains, however as to whether or not the linked incidental factors of motivation or age can be regarded as having given rise to the results of the sample groups in the first two clusters, or whether, alternatively, the direction of causation may be the reverse, with the strong performance of such groups accentuating the differentiation of performance of the older and more motivated students as a whole. In order to further investigate this question, data concerning the relative performance of age and motivation groupings have been examined. The data are presented in summary form in the table at Figure 70 (below). Also included are academic progress and success index data for the members of the first cluster taken as a whole and likewise for the second cluster.

To illustrate the effect of motivation, the upper motivation bands have been grouped, and their mean academic performance and success indices calculated. It should be noted that the mean motivation index for the combined upper motivation bands is 37.8, which is higher than the mean motivation index for either of the first two clusters of sample groups (ref Figure 68), and higher than all but two of the individual sample groups in the first cluster (groups 4 and 7).

To provide for an age comparison, mature age entrants (ie those who were at least 21 years on 1st January in their year of commencement) have been grouped. The mean age of the mature age participants is 27.5, just below the mean age of the first cluster, and above that of the second cluster (ref. Figure 68).

Figure 70. Table showing academic progress and success indices for the first and second clusters of sample groups (each taken as a whole) against equivalent data for mature and high motivation participants.

	Number of Students	Mean Progress Ratio	Mean W.A.M.	Mean Success Index	Std Dev. Success Index
First Cluster of Sample Groups	518	87.9	65.3	57.4	23.27
Second Cluster of Sample Groups	839	83.8	62.3	53.9	23.66
Combined Upper Motivation Bands (mean M. Index = 37.8)	2,696	81.3	59.9	52.0	22.68
Participants Aged 21 or over at entry (mean Age = 27.5)	719	86.2	64.2	54.9	22.86
All Participants	3,086	79.1	58.7	51.3	23.75

As can be seen at Figure 70, although the mean motivation of the first and second clusters of sample groups (reported at Figure 68, as 37.2 and 36.7 respectively) was below that of the combined upper motivation bands (37.8), the mean success indices of both clusters varied from the mean for all participants by almost four times, and almost nine times the variation produced by motivation alone. It was therefore concluded that the success of the first and second clusters of

sample groups was not caused by motivation, but rather, may have contributed to the observed higher performance of motivated groups.

The mean success index of mature participants, a group whose mean age falls just below that of the combined members of the first cluster of Sample Groups varies by only a little over half the variation produced by the first cluster. A narrower age sample, those aged 22 and above produced the same mean age as the first cluster (ie 28.9), but still only attained a mean success index of 55.7.

Although the mean success index of the second cluster of Sample Groups was less than that of the mature participants, the shortfall of 1.8% (53.9 as against 55.7) compared favourably against the 10.9% difference in their mean ages (24.8 as against 27.5). To further test this relationship, participants were selected in descending order of age until the mean age of the group so selected matched that of the second cluster (ie 24.8) and the mean success index of this group was found to be 52.9.

On the basis of these analyses, the conclusion reached was that the performance of neither the first nor the second clusters of sample groups could be attributed to gender, motivation or age, but instead must be regarded as linked to the narrower criteria which were the basis of selecting the individual groups.

This finding is significant in two ways: it is indicative of the viability of the methodology that it has provided a basis to reach a point from which new insights may be possible, and it provides some first clues

about a list, albeit far from exhaustive, of background characteristics which are linked to success.

To place the success of the first cluster of sample groups into perspective (or rather, the margin by which their mean success index exceeded the mean for all participants), it can be favourably compared to the effects of tertiary entry scores as an indicator of success. Since not all scored entrants in 1994 were participants, a comparison of mean weighted average marks provides a common point of reference. The combined membership of the first cluster of sample groups is a group of 518 participants, who represent 16.8% of all participants. The group of 1994 entrants who scored at or above 127 represented just under 15% of the scored entrants in that year. The mean weighted average mark of the top 15% of scored entrants in 1994 was 58.8, as against the mean weighted average mark for all 1994 scored entrants of 52.4, a difference of 6.4 points. The mean weighted average mark of the first cluster of sample groups of 65.3 compared favourably, as did its elevation above the mean weighted average mark of all participants of 6.6 points (ref Figure 70) and its reduced standard deviation.

The comparison suggests that background characteristics such as some of those used as the criteria for the first cluster of sample groups may be viewed as potentially stronger indicators of academic potential and, by inference, success, than traditional score based selection methods. Since the list of criteria for the sample groups was by no means exhaustive it is conceivable that other criteria with even stronger predictive value, might be identifiable.

The above analyses have been based on knowledge gleaned from the review of literature and previous research, as confirmed by aspects of the work described in foregoing chapters, variously pointing to four factors which are linked to success: scores, gender, age and motivation. It has been demonstrated that seven among the trial set of sixteen alternative criteria chosen somewhat arbitrarily for the purpose of the preliminary and formative explorations of this program are of a predictive value which is equal or superior to that of the four known correlates. It seems likely that the procedures applied in the program could be equally effective in revealing other criteria related to success.

12.5 The Non-Traditional Educational Pathway

Having established that the links between the sampling criteria for several of the sample groups and *success* exceed those of the four formerly known correlates, at least in relation to the two cohorts which were the subjects of this research, attention was turned to the sample groups themselves. Beyond an immediate understanding of likely causal links and relationships within the emergent trends viewed at Figures 65 and 66, there is the question as to the meaning, interpretation and implications of the findings.

To begin to consider this question, it is first necessary to review the sampling criteria for the sample groups which fell within each of the three clusters identified previously. To facilitate this deliberation, the abbreviated descriptions of the sampling criteria have been grouped

together within the emergent clusters identified earlier and are thus presented at Figure 71.

In considering the criteria sets grouped within the first cluster at Figure 71, it was readily apparent that all of the criteria so grouped related either directly or indirectly to age. Group 13 was solely selected on age, and groups 7 and 6 combined age with other criteria.

Figure 71. Table grouping the sampling criteria for the sixteen sample groups within success clusters in descending order of mean success indices.

	Sample Group Number	Abbreviated description of Sampling Criteria
1st Cluster of Sample Groups	7	Mat. Age with <1 yr related exp. but ≥5 yrs unrel. wk. exp.
	9	2 to 5 yrs related wk. exp. plus 2 to 5 yrs unrelated wk. exp.
	3	Incomplete Secondary with ≥2 yrs relevant wk. exp.
	4	Incomplete Secondary with ≥2 yrs unrelated wk. exp.
	13	Age range from 25 to 35 yrs.
	8	Unrelated prior studies but ≥2 yrs relevant wk exp.
	6	Mature age with ≥5 yrs relevant wk. exp.
2nd Cluster of Sample Groups	14	Age range of 36 and above.
	15	Independent ≥2 yrs and self supporting (incl. Austudy).
	10	≥5 yrs related wk. exp. plus ≥5 yrs unrelated wk. exp.
	5	Related prior studies (yr 12) plus 2 to 5 yrs relev't wk. exp.
3rd Cluster of Sample Groups	1	School leavers with related prior studies.
	2	School leavers with unrelated prior studies.
	12	One or more type of difficulty/disadvantage.
	11	No related prior studies or work experience.
	16	Age range <25 yrs and studying part-time.

The remaining four groups were selected on criteria which related in various ways to work experience of two or more years duration and, whilst some participants may have obtained some experience whilst studying, most could be expected to have gained such experience after

concluding their secondary studies and thus to be older than school leavers entering their courses through traditional normal entry procedures.

Thus, to varying degrees, all of the sample groups within the first cluster were viewed as representing students who had taken non-traditional pathways to higher education. Moreover, since each of the groups individually (as well as when viewed as a whole) significantly out-performed mature age students, it must be concluded that it was the aspects of the sampling criteria which went beyond the mature age definition which accounted for such attainment.

When the mature age definition is discounted as a cause of the findings, the remaining criteria for all but one of the seven groups in the first cluster present various combinations of related and unrelated studies and work experience. Group 13 must therefore be considered separately since its sampling criteria was solely age related. The strong performance of group 13, particularly when contrasted with group 14 in the second cluster (which produced a mean success index below but comparable to that for all mature age participants) provides a clearer picture of the relationship between age and success.

What is immediately striking when viewing the criteria for the remaining six groups of the first cluster (and after having discounted mature age as a causal factor), is the strong presence of unrelated work experience (groups 7, 9 and 4) and unrelated studies (group 8), with only two of the highly successful cluster of groups having

related work experience without the presence of equal or greater unrelated experience within their criteria. Equally striking is the absence of any of the groups with related studies among their criteria from the first cluster.

Similarly revealing are the relationships between groups 3 and 4 and between groups 1 and 2. In both cases these pairs of groups fell adjacent to one another in the descending order of mean success indices. In the case of groups 3 and 4, the fact that the work experience of group 3 was related to the course being undertaken had a barely perceptible impact upon the mean success of the group. Similarly, the performance of group 1 was not widely differentiated from that of group 2, despite the polar opposition of the selection criteria.

Apparently, the relationship between prior studies and prior work and the discipline of the course to be undertaken is not highly significant as a factor determining success. This flies in the face of conventional wisdom upon which the admission selection criteria for undergraduate courses are frequently based.

These findings present a challenge to the orientation of recruitment and selection for undergraduate courses, as well as providing food for thought about the appropriateness of contemporary mores in undergraduate teaching methods, curricula and course structures across a number of fields.

SECTION SIX: Conclusions

Chapter 13:

Descriptions and Discoveries

Throughout the chapters of this thesis, observations have been drawn from the component parts of the analyses, and for the most part these remain within the chapters which describe the processes which produced them.

It is not the purpose of this chapter to reiterate the various particular insights which have been gleaned in the course of the program. Instead, the following pages have been devoted to the task of looking at the program in its totality, drawing together the various elements and reviewing what has been achieved.

The immediate aims of the program were twofold: the establishment of a defensible, integral measure of success and the deployment of such a measure to produce a model for a success matrix which might provide a new way to view, and review, undergraduate selection and teaching. Beyond the immediate aims, the program sought to explore the relationships between traditional and non-traditional backgrounds of undergraduate students, and in so doing, to trial the instruments developed for this purpose.

To begin the process of reflection upon the course that the program has taken, it is appropriate to review the two immediate aims: the success index and the success matrix.

13.1 The Success Index Viewed with Hindsight

The success index was developed, in part, in response to competing views about what is or is not a valid approach to the definition and measurement of success. In light of the literature in this arena, much of which adopts a position which was defensible from a given standpoint (but questionable from others), some path towards reconciliation of these conflicts and towards establishment of a more universally acceptable measure seemed desirable. Publication of these ideas, and presentation of them at local and international conferences over several years has provided an opportunity to gauge the response of other scholars and practitioners to these ideas, and to confirm that the principles upon which they are based, if not the details of their application, enjoy some acceptance. That is there is some agreement that a single, widely acceptable, integrated measure of students' success is desirable, but predictably, a little less unity about the balance components which should be represented in such a measure.

For the specific purposes of the program, the success index has been of value. That is, the data which were produced by its application withstood careful scrutiny and analysis across various phases of the program, and its use proved relatively simple and consistent. Moreover, evidence which emerged during the analyses did not so much call into question the validity of assumptions upon which the index was based as confirm them. For example, the index was repeatedly viewed against other measures of academic performance, notably the progress ratio and the weighted average mark in order to

better understand and evaluate the effects of its application, as well as to provide for more ready comparison with (and extrapolation of the results to) other studies and other situations. In fact, it may be observed that although the success index performed differently from the progress ratio and weighted average marks, these differences were most notable (and at times quite radical) at the level of the individual participant, and became less marked when the mean indices for groups of participants were viewed.

At the conclusion of the program, it is both reassuring and a little surprising to be able to report that none of the findings which were based upon the success index were called into question when the analyses were repeated using weighted average marks or progress ratios. To put it another way, the program would have followed a comparable course and reached similar conclusions had it been decided to dispense with the index and base the investigation solely on marks. This is not to say, however, that the success index did not achieve what it set out to, nor that the success index could not have yielded, in more extensive analyses than were possible within the scope of this program, insights beyond those which were attainable using more conventional measures of academic performance.

The context within which the research reported here was conceived, was one in which frustration (with the limits of the application of quantitative research methods to the study of student achievement at university) had, over several decades, spawned a range of other approaches (ref. Figure 1, pg 20). In responding to the questions raised by researchers about the legitimacy of narrowly focussed

measurement approaches, and to the more refined definitions of success which had emerged and gained acceptance, as discussed in Chapters 2 and 3, it was seen as necessary to move towards a more broadly based methodology. The inclusion, therefore, of student self-assessment data concerning aims and goals in the calculation procedure served to provide a broader base for the claim that success was being measured, and was thus of pivotal importance to the program.

As well as confirming the operation of the success index, the identification and exploration of trends (eg those related to motivation and to disadvantage) in the analyses provided some reassurance that the various measurements had yielded meaningful data.

From a pragmatic point of view, it must be conceded that production of the success index is neither easy, convenient nor cheap, as it necessitates the collection of student self-assessment data at a particular time during the first year of their studies. Moreover, although the results of application of the success index in this program have been consistent and satisfactory, it is not known what effect might be seen if the student data were collected at a different time or by a different mechanism. In fact there is evidence to suggest that if such information were collected as part of an enrolment process, for example, the response pattern and the indices so produced might be significantly altered (ref. Chapter 6).

Notwithstanding the acceptance that the more broadly based approach to measurement of success may enjoy, there may be merit

in applying the progress ratio and/or weighted average mark to subsequent analyses where there is no imperative to provide a student centred point of reference for the measurement or where the collection of the additional data required for calculation of the success index is not possible or practical.

With this in mind, it is suggested that a single index of performance drawing upon elements of the progress ratio and the weighted average mark could be developed to provide the same ease of analysis and interpretation as the success index, but without necessitating the collection of data other than those which would ordinarily be routinely available within university records. The experience of this program, which points to the inclusion of a student-centred point of reference in the calculation having had no material effects upon the findings throughout the study, seems to indicate that a similar effect could be achieved by the use of a simpler index of this type.

13.2 Applicability of the Matrix Approach

In considering the merits of the success matrix described in Chapter 12, it is necessary to separate the questions concerned with the procedure used from the issues associated with the findings so achieved. In the first instance, some comments upon the procedure are in order.

The success matrix, ie the process used to convert a single index arithmetically and chart it graphically, as described in Chapter 12 and presented at Figure 66, served the purposes of the program. That is to say, it provided a tool for analysis which aided in the

interpretation of results which were not readily understood in the form of tabulated data. It was in fact the matrix which facilitated the observation that the sample groups were clustered, and thereby led to a series of important insights.

The principal limitation of the matrix approach as applied in the foregoing analyses rested in its portrayal of the size of the standard deviations for the sample groups. This was in part a function of the data and the spread of data for the groups under review. Because the variations in the standard deviations produced by the success index were not large, the differences were not readily perceptible when displaced to sit about the means as at Figure 66. The displacement of spread about the mean was, on the other hand easily observable.

Were the matrix to be used across a large volume of data with little variation in the standard deviations, the format used could be adapted by the inclusion of a scale or a number within the standard deviation bars to enable variations to be read from the one chart, rather than requiring cross referencing to a data table. However it should be acknowledged that it is only when the differences in standard deviation are sufficiently large as to be of an order comparable to the differences in mean indices that the variations between them are such as to warrant close attention in the interpretation of the indices.

The experience of this program provides a basis from which to conclude that the application of a matrix approach to a single index has potential for application in related studies in other situations.

None of the available evidence suggests that these tools would not be of equal use, for example, in a like analysis conducted within another institution.

13.3 Standards of Entry; Selection for Equity

Beyond the foregoing observations about the effectiveness and applicability of the methods and procedures used in the program, there are a number of issues associated with the implications and possible impact of the findings.

Analysis of the sampling criteria for the first cluster of groups on the success matrix in Chapter 12 provided the basis for a positive and a negative view of the way things have been done in Australian universities, including Victoria University of Technology, in recent decades. The positive represents an affirmation of mature age entry provisions; it is evident that if mature students had not been admitted to higher education courses at Victoria University of Technology in 1993 and 1994, or if the numbers of mature entrants had been curtailed, the number of highly successful students would have been reduced. Mature age entry policies within a number of universities have been framed in light of similar effects observed there, and it seems probable that the relationship between age and success which exists elsewhere in the Australian higher education system is comparable to that found among the participants of this study.

However, the analysis of the outcomes achieved by the sample groups within the first cluster on the success matrix revealed that these were not attributable to age. Rather, it was concluded that they were

attributable to other factors linked to age, and that the effects of causation of these other factors might be in part responsible for the observable link between students' age and their success. It is the nature of the other factors which were identified in the preceding chapter which gives rise to an observation of a more challenging variety: that the most highly successful students are admitted in spite of, rather than because of, the recruitment and selection strategies which have been customary at Victoria University of Technology and other Australian higher education institutions for decades.

The most highly successful group of students identified on the success matrix were non-traditional entrants of a very particular kind; many of them brought with them experience and/or prior studies which were not related to the courses to which they were admitted. Moreover, the adjacent position of several groups with apparently opposite selection criteria on the matrix suggested that, other things being equal, the relevance or otherwise of previous studies and experience is of little consequence as a determinant of success.

As was shown in the review reported at Chapter 9, conventional selection measures may mitigate against the achievement of equity goals. Alternative category entry schemes already go part of the way towards addressing this issue, yet the popular view of selection both within universities and in the media and among prospective university applicants and their families remains focussed on scores.

The investigation within this program was, it must be acknowledged, an experiment and an exploration of alternatives. Moreover, the analyses were focussed upon data from a single institution. In light of this, generalisations based on the findings of the program can only be applied beyond the institution and the years from which the data for the program were drawn by extrapolation and hypothesis. Nevertheless it has been deemed a reasonable supposition on the basis of this limited study, that there are factors other than the four previously known correlates of success (score, age, gender and motivation) which are of equal if not greater importance, and that this insight may have general application.

To the extent that the effects of score based selection may, albeit incidentally, work against the achievement of access and equity objectives, alternative selection procedures based on other indicators might be expected to have an opposite effect. As long as selection requirements and selection standards are framed narrowly, in terms of a predictable and sequential view of learning and life experience wherein related prior studies and related work backgrounds are favoured in course admission selection criteria, access and equity considerations are likely to remain at the margin.

Arising from the application of the matrix approach, it is contended that based upon procedures trialed within this program, alternative frameworks for student selection and admission should be developed, in which alternative indices which are not based upon related backgrounds nor upon study scores, are given a role.

13.4 Recruitment and Selection Implications

Changes in tertiary admission practices which have been introduced in Victoria since the commencement of the program, are of interest.

Firstly, in 1995 universities across the State used a single tertiary entrance rank as the basis of score selection for undergraduate admission. This is significant in that it reduces the role of subject specific bonuses for applicants for particular courses and it provides a single selection mechanism for all courses in which subjects are scaled so as to be of equal value (regardless of content or perceived level of difficulty).

A second recent development which, in light of the findings of this program, should be applauded, is the policy shift away from Federally imposed school leaver quotas on undergraduate course intakes. This means that members of groups who are under-represented in higher education and who have excellent prospects for success, will not be turned away in favour of marginal scored school leavers merely in order to meet externally imposed quotas.

A third trend which should be applauded is the reducing emphasis on prerequisite studies in some institutions and disciplines. The findings of this program suggest that wherever prerequisites exist, they may operate to exclude a portion of the potential applicants whose prospects for success (and prospective contribution to the profession or field served by the course) are greatest.

These aforementioned changes do not go far enough, however. Course recruitment for many courses is targetted narrowly, seeking

to attract as applicants, individuals who already have a study or work background within a given area. It is contended that recruitment should be targetted otherwise; that attention should be directed first and foremost at those groups who can be identified as under-represented in a given institution field or discipline, with little or no attention paid to previous experience or study.

It is also contended that the principles of selection for many courses should be overhauled. In part such an overhaul would entail the amendment of selection criteria to remove favour given to related backgrounds, whether study or work, and to replace these with criteria based on the application of the index and matrix approach trialed here, or with a selection order derived from course and/or institution equity indicators such as those described by Martin (1994). Moreover it is contended that the traditional practice of imposing prerequisite study requirements should be reduced if not eliminated, and alternative arrangements made within curriculum design and delivery to compensate as necessary.

13.5 Prior Learning Considerations

One need not necessarily conclude from the results of the application of the success matrix to the trial sample groups, that prior learning is not useful, or significant, in relation to the performance of a student after admission to an undergraduate course. What one might say instead, is that in some cases the relative absence of prior learning related to the course, together with the presence of unrelated studies or experience, equipped students to succeed to high

levels, and was of at least equal value to some more conventional (related to the course in question) backgrounds.

There are several ways in which students' backgrounds might be seen to impact on their ability to achieve the aims of an undergraduate course. Students whose studies are related to aspects of the undergraduate course to which they have been admitted may have an initial advantage in that they may already be familiar with some concepts and may have already acquired some of the knowledge required in the field of study. This may also be true of those whose backgrounds include related work, but as an added benefit, these individuals may be able to more readily visualise, drawing upon their experience, the application of many of the abstract ideas presented in the course. These are potential positive effects.

There are potential negative effects which might counter the benefits of related prior studies or work in some cases. One of these is that a long history of involvement with a particular set of ideas may on occasions lead to rigid structures, concepts or paradigms which render the individual less open to challenging ideas of the type which may be encountered at the higher theoretical levels encountered in an undergraduate course. Another possible negative effect is that familiar phenomenon of staleness: those things which engaged our interest when we were fourteen may hold less allure by the time we are eighteen and sitting in the first year lectures of a university. The heavy reliance of undergraduate selection procedures for many courses on prerequisite studies engenders a situation where

decisions made by fourteen and fifteen year-olds (or worse, by their parents on their behalf), dictate their options three or four years later.

Related work experience is featured among the selection criteria for several of the groups within the first cluster whereas related studies is not.

This may be because of twin forces which have been identified:

i) the additional benefits identified as being associated with prior related work experience over those associated with prior study, together with

ii) the potential for greater impact of one or both negative aspects (of prior exposure to the field of the course to be undertaken at undergraduate level) on prior study as against prior work experience.

Added to these considerations is the fact that individuals with two or more years' work experience in a given field are likely to be at least a couple of years older, to have been self-determining adults for a period, thereby better enabled to make decisions about what area of study may hold their attention, or enthusiasm, for the three or more years of an undergraduate program.

Despite the counteracting effects of potential negatives in some cases, the benefits associated with related prior studies or work are significant, and the presence of related work as a significant element of the selection criteria for four of the groups within the first cluster and the presence of related studies in the criteria of one of the groups in the second cluster, still above the mean success index for all

participants, attests to this. This begs the question as to what might account for the presence of unrelated work experience in the criteria of three of the groups which were found to be in the first cluster, and unrelated studies in one.

The significance of unrelated studies and experience may best be explained by referring to the works of Arthur Koestler and Edward de Bono (Koestler, 1964; de Bono, 1994), in which evidence is produced to suggest that insights which may be blocked from view from the standpoint of those who operate within a well understood paradigm or frame of reference, may be more readily visible to those whose conceptual base enables them to re-apply insights from elsewhere. It is reasonable to suppose that an ability to make connections across the boundaries of fields of study and intellectual endeavour, might be a factor which compensates for the lack of direct knowledge and understanding among individuals in several of the high achieving sample groups examined in the preceding chapter.

13.6 Policy Implications

A number of policy implications associated with the formative work and analysis described in Chapters 6, 7, 8 and 9 have been the subject of comment within those chapters. For the sake of brevity they are not repeated in full here, but rather, are presented as a brief summary.

It has been concluded that the most significant barrier to the participation of ethnic and culturally disadvantaged groups is that associated with language, and therefore, provision for additional

language support can be seen as a key component of efforts to address cultural disadvantage.

It was demonstrated that the overall success achieved by students born outside Australia is lower in those cases where a greater number of students from the same country or region are among the intake. In light of this, policies which encourage maximum integration and minimal interdependence among expatriate students have the potential to assist both overseas students and members of immigrant and culturally disadvantaged populations.

In light of an examination of data concerning disadvantage, it is clear that students who are able to identify obstacles facing them early are better placed to avail themselves of the support services provided and, in doing so, to substantially correct or compensate for perceived deficiencies. Efforts should therefore be made to encourage reflection on the part of commencing students on their circumstances and the potential obstacles facing them in order to improve the effectiveness of academic support services, and further reduce the impact of various types of disadvantage.

A balance between the liberalisation of admission policies and the extension of support mechanisms, it has been observed, is a key element to the management of equity. If such a balance is not achieved, it has been concluded that a consequent under-achievement on equity targets on the one hand, or higher than necessary levels of attrition on the other, are the probable result.

It has become clear in the examination of data available to the program, that information collected from students at enrolment may differ substantially from information collected by other means. Some consideration should therefore be paid to the methods of collecting data, and a separate collection of statistics, perhaps during orientation or otherwise outside of the formality and hurly-burly of enrolment, would be like to lead to more reliable and useful data collection. Changes in the enrolment process with the introduction of telephone and online enrolment technologies may provide further opportunities for refinement of statistics collection procedures.

Whilst the links between age, motivation and academic performance have previously been documented, they were confirmed by the results of this program of research. In concert with observations about alternative mechanisms for selection, it is reasonable to contemplate alternative selection policies wherein selection for motivation would sit alongside programs specifically directed at raising and maintaining student's motivation after their admission to the university.

Despite the attention paid to tertiary entry scores on an annual basis, the findings of this program are that scores accounted, in all, for a minority of the selection decisions in undergraduate admission at Victoria University of Technology in 1994. There is evidence to suggest that in this respect, Victoria University of Technology is not unique. This runs counter to public perceptions, leading to situations where decisions may be made by individual students on inappropriate grounds. As a matter of policy, factual information

about the diminishing role of scores in selection for admission to university courses should be more widely promulgated.

The relative inefficiency (essentially unchanged since it was first documented in Australia four decades ago) of score based entry as a basis for predetermining the performance of students so admitted should be viewed in context, and the comparable efficiency (in terms of outcomes if not ease of selection) of various other selection mechanisms acknowledged. Given that it has been shown that score based selection works against increased representation of under-privileged and non-traditional entrants, a policy shift away from the current continuing emphasis on scores is desirable.

The findings of the analysis of the success matrix indicate that non-traditional pathways into undergraduate courses, wherein entrants come from work and/or study backgrounds which are partially or fully unrelated to the studies to be undertaken, are amongst those which produce the most highly successful students whose overall performance matched or exceeded that of the top 10% of scored entrants (based on the 1994 data available to the program).

This suggests that a policy shift away from the conventionally narrow paths into specialised undergraduate courses is warranted, and a number of related implications flow from this. Several of these have already been discussed under the heading of Recruitment and Selection Implications (above), but a further two issues warrant some attention.

13.7 Curriculum and Delivery Implications

Some observations were made at the close of Chapter 6 about the appropriateness of curriculum, teaching methods and concurrent support for the needs of diverse groups. From the vocabulary and examples to the conceptual framework, lectures and texts frequently speak primarily or only to the dominant culture. In the later years of an undergraduate program, after students have undergone acclimatisation, this should be less problematic, but in the first two or three semesters, it may be an added burden for under-represented minorities. It was observed that a number of excellent studies have recently been published in which alternative teaching methods and curriculum delivery strategies are discussed, and several of these were cited.

In light of the findings of the success matrix analyses, it is appropriate to pay similar attention to the position of individuals who come to higher education with unrelated work or study backgrounds. To the extent that the vocabulary, examples and conceptual frameworks cited in undergraduate curricula speak, in the first instance, to the dominant groups, it can be seen that school leavers (generally with prerequisite studies which relate to the course), and mature age students with related experience represent such a majority. To illustrate this point, among the 3,086 participants in the program only 354 or 11.5% were non-school leavers without a predominance of related studies or two or more years related work experience.

Not infrequently, course accreditation documents and subject curricula make reference to presumed knowledge. Although the minority of students who are admitted without the background study or work experience demanded by the curriculum achieve good results overall (the 354 participants cited above achieved a mean weighted average mark of 60.8, which is 0.2 points above that achieved by the second highest band of 1994 scored entrants as shown at Figure 56) their performance is not as predictable as some other groups (the standard deviation associated with the mean weighted average mark of the 354 participants was 14.56, which does not compare favourably with the standard deviation of 11.67 for the high tertiary entry score group). This reduced conformity of performance may be attributable to the additional challenges associated with negotiating a curriculum which presumes knowledge that this group didn't bring with them.

The achievements of this particular kind of non-traditional entrant in the face of an unsympathetic curriculum, can be seen as indicating several things. Foremost among these, one might assume that such achievements could be further enhanced, and more reliably achieved, were the curriculum design and delivery techniques to be modified and/or made more flexible in such a way as to be more accommodating of those who come without related prior studies or experience. Should this prove to be the case, then the relative performance of several of these groups may have the potential to be outstanding, beyond the achievements of any other sub-group, traditional or otherwise, examined throughout this program.

Related to this conclusion is the proposition that if an 11.5% minority can achieve well above average results within a curriculum framework which does not cater well for their transitional needs, a much larger group of entrants with similarly unrelated backgrounds, were they to be admitted to courses which made no call for presumed knowledge, might be expected to show average or better than average achievements.

It is considered that the main focus of curriculum changes which are considered desirable in light of the observations made above, would pertain to the first year of undergraduate programs, particularly those which currently demand high levels of prior knowledge and/or cite one or more prerequisite subjects.

Within the first year of each program, subjects should be structured so as to provide background and bridging studies which lead in to the specialised content that is to follow. Moreover, elective options should be used within the first year to enable students who have knowledge gaps to fill, to undertake supplementary work which gives added support to their efforts to make accelerated entry to a field to which they have previously had limited exposure.

Whilst some of the students whose entry to a course has followed more conventional or traditional paths and who thus have some related prior studies and/or experience will benefit from the opportunities for revision and consolidation that the proposed modifications would provide, others may not, and should be permitted to structure their first year programs otherwise.

Beyond these curriculum design and structural flexibility issues, there is the question of teaching styles. Just as students from cultural backgrounds which are in a minority may be left at a loss when assumptions are made about vocabulary or prior understanding in the lecture theatre, laboratory or tutorial room, so too may students who come without the related background which the majority have. The imperative for more responsive and interactive, less insular and majority-focused teaching delivery strategies is redoubled in light of this overview of the findings of the program.

13.8 Course Design Implications

Some references were made above to the desirability of greater flexibility in the structure of the first year of courses. There is, however, a further set of issues relating to course design which warrant comment here.

From the mix of related and unrelated studies and work experience which featured heavily in the sampling criteria for the first cluster of sample groups examined in Chapter 12, it has been concluded that experiences and/or insights from outside a given discipline or field of study, as suggested by Koestler, do Bono and others, may allow accelerated understanding and increased energy and creative potential within a given area. It has also been suggested that this phenomenon may in part account for the strong presence (and apparent causal link to success) of the unrelated studies and work experience in the first cluster of sample groups.

Accepting that diverse experience, knowledge and/or insight may have a bearing upon the ability of students to succeed in undergraduate courses, one must acknowledge the implications of this for the many students who are admitted under current selection practices with minimal extraneous or unrelated study or experience. Since the advantages which accrued to such students from their prior knowledge and experience were, apparently, matched by advantages which accrued to those whose unrelated experiences gave them breadth of vision, improvements in the performance of mainstream conventional entrants could be expected if their scope of experience could be extended. This is not something which can be expected to occur (or which must necessarily occur) prior to the commencement of undergraduate coursework.

It was suggested in the preceding sub-section that greater structural flexibility in the first semesters of undergraduate courses might provide opportunities for non-traditional entrants (eg those with unrelated study or work backgrounds) to become acclimatised. It was observed that these course components might be of little benefit to some or all students whose prerequisite studies have adequately equipped them with vocabulary, conceptual orientation and background knowledge. It is therefore suggested that while those entrants whose backgrounds do not relate to the field being studied are undergoing transition and acclimatisation, students whose background is more narrowly focussed within the confines of the discipline should be extending their conceptual framework outside the field of study.

Such extension processes, in concert with new opportunities for acclimatisation and transition for non-traditional entrants would engender a situation where all students might be expected to benefit equally from the advantages of discipline focussed background knowledge, concepts and skills, and the enrichment, vision and insight brought from the cross-fertilisation of ideas.

It is envisaged that such structural adaptations would fit within existing conventions for elective or optional studies within courses, but that these should be extended and re-grouped to facilitate the flexibility and cross-fertilisation which is sought. Particularly in those courses where elective options have been a small component of total coursework requirements (eg less than 25% of load in any one year) it is suggested that significant adjustments are called for.

13.9 Further Research

Throughout the five years since the formal commencement of this program at the start of 1992, it has been necessary to confine the work of the program to those aspects which had a direct bearing on the aims and purposes with which it started, there being any number of puzzling and vexing questions along the way which one might have been tempted to pursue.

At this point, despite the volume of work which is described in the preceding pages (and that referred to in the appendices), it is clear that the program can be viewed as little more than the preliminary testing of a set of ideas.

The most pressing area in which further research is recommended, therefore, is in the wider and more detailed testing of the findings which have been reported here. The findings reported herein prompt many questions, but foremost among them are the following:

- Do the results which have been reported, which are for the most part based on data which are aggregated, including all fields of study, apply equally to the various discipline and faculty subsets within the data?

- Do the various conclusions reached at each stage of the processes described in Chapters 6 to 12 have application within other institutions and, if so, are they confined to the Australian higher education system, or is their significance more general?

- Are there other sampling criteria which, when fed into a matrix, would produce results which vary widely from those of the sixteen groups trialed herein (eg since few of those groups showed means significantly below the overall mean, and since a majority were well above the overall mean, which of the criteria beyond those examined are associated with under-achievement)?

Whilst some analysis, and some consideration, has been devoted to these questions during the course of the program, they could not be addressed here, and provide a substantial base for further reflection and research.

Since the application of the comparative matrix in the substantive analyses of this thesis, appears to have merit as a means to identify

links between background characteristics (and especially combinations of characteristics) and success, there is opportunity for further work towards the development of a means to efficiently apply the procedure exhaustively. Adaptation of one of several computer applications for data analysis could be expected to be a substantial part of such work.

SECTION SEVEN: Supporting Materials

Part 14:

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Part 15: Appendices.

Appendix 1.

Glossary of Terms

Several of the terms used in this paper warrant clarification or definition.

Academic Year:

the time period which falls between the first day of teaching in semester one and the last working day before the first day of teaching of semester one in the subsequent year.

Alternative Category Entry:

any one of various categories of eligibility to apply for admission, other than normal entry, which requires satisfactory completion of an approved year twelve course. Alternative categories at Victoria University of Technology for 1993 and 1994 included mature age, continuing difficulties during schooling, aboriginal and torres strait islander descent and later year entry.

Box Plots:

visual displays of data in which mean and standard deviation measures are represented in a single graph by the placement of horizontal bars and vertical rectangular columns respectively.

Comparative Matrix:

see **matrix of equivalence** (below).

Grade Point Average:

a system of averaging of higher education results where each grade is allotted a number (eg High

Distinction = 5, Distinction =4 etc), with the resulting numbers being weighted by subject load and then averaged to produce a quantum of academic performance.

Later Year Entry:

admission of a student with advanced standing where it is deemed appropriate that the studies which the student enrols in initially will, in the majority, be drawn from the second or subsequent years of the course to which he/she has been admitted.

Matrix of Equivalence:

a graphical construction in which the mean success indices and accompanying standard deviations are presented in a format of box plots which facilitate comparison of different sub-groups with the overall success index performance of the total sample (see also **success index**).

Mature Age:

(of a student) having achieved the age of 21 years at or before 1st January in the year in which a course to which a person has been admitted is to commence. Also may refer to application for admission under the alternative category for persons of mature age who do not satisfy normal entry requirements (see also **alternative category entry** and **normal entry**).

Non-Award Studies/Subjects:

individual subjects which may, or may not, be suitable for inclusion in a program of study leading to the award of a degree or diploma, but which are undertaken by a student whilst he or she is not enrolled for an award.

Normal Entry:

the standard eligibility requirements which intending applications for admission to an undergraduate higher education course must satisfy. At Victoria University of Technology in the years 1993 and 1994, applicants for normal entry were required to have completed an approved year twelve qualification (eg the VCE).

Partial Credit Model:

a scaling methodology which employs multiple regression against the metrication of student abilities and subject difficulties in the production of a referenced scale of achievement.

Participants:

those students from among the target group who indicated their choice to take part in the research by completing and returning the survey and, by implication, indicating their approval of the release of enrolment and results data to the program, and who completed one or more first year subjects.

Pass Rates:

the aggregates of subject load associated with subjects passed, as a percentage of the aggregate subject load of all subjects attempted by individual students.

Pool of Ability:

a theoretical construction in which it was contended that a fixed proportion of the population were endowed with intellectual abilities, aptitudes or inclinations which would enable them to successfully undertake and/or benefit from higher education. Since the 1960s this idea has been

generally accepted to be invalid, or at least to be a social construct rather than an objective reality.

Program, the:

As used in the legislation and regulations of Victoria University of Technology, the word "program" relates to an approved research program undertaken to qualify for the award of the degree of Doctor of Philosophy (ref: Regulation 6.1.9 Part B).

The word "program" is used throughout the thesis to refer explicitly to the program of research arising from the approved candidature proposal for this doctoral award, incorporating the review of literature, the research design, the development of software, the collection of data and their analysis, interpretation and description.

Progress Ratio:

the sum of the load of all subjects attempted and passed divided by the sum of the load of all subjects attempted (whether passed or not, excluding late withdrawals) expressed as a percentage.

Progression Index, Progression Quotient, PPASS:

the proportion (decimal fraction) of students in a group who have passed 75% or more of the subject load in which they were enrolled.

Respondents:

the group of students who responded to the invitation to take part in the program.

Student Progress Unit:

the ratio of study load successfully completed by a student or students, to the total student load for the

student(s) at the relevant enrolment census date(s) (expressed as a decimal fraction).

Success:

the academic achievement of a student in undergraduate studies as a function of the student's performance in assessment, and compared to self designated goals in relation to grades and course completion time.

Success as defined above can be evaluated progressively (on a subject completion basis) and cumulatively, without reference to factors such as course progress or completion.

Success Index:

a weighted average mark, calculated from studies undertaken in the first academic year of a higher education undergraduate course, which has subsequently been adjusted by application of a penalty for any shortfall against course completion goals (as expressed by the student), and adjusted against motivation (self-assessed).

Success Matrix:

see '**matrix of equivalence**'.

Target Group:

the group comprised of all the students who met the program criteria and were, therefore, sent letters of invitation to participate in the research (whether or not they chose to respond and participate).

Tertiary Entrance Rank:

a percentile ranking of applicants for admission to undergraduate courses, which is generated by the application of scaling to marks, results or scores

achieved by students at year twelve, and which is used to rank applicants for admission to courses for which selection is competitive (see also **tertiary entrance score**).

Tertiary Entrance Score:

a single numeric score, calculated using an agreed formula, as a composite of the various marks, scores or results achieved by a year twelve student, expressly for the purpose of informing decisions about admission to courses for which selection is competitive (see also **tertiary entrance rank**).

Weighted Average Mark:

the average of raw subject marks weighted by subject load and expressed as a percentage.

Part 15: Appendices.

Appendix 2.

The Questionnaires Completed by Respondents

As described in Chapter 4, there were four separate mailings of questionnaires to prospective program participants. These were an initial mailing and a follow up mailing in 1993 and a further initial and follow-up mailing in 1994.

The survey respondents were not identified by name, but instead, the survey forms included a randomly allocated reference number which enabled the matching of responses with the records of the students from whom they came and, subsequently, with the first year academic results of those students.

Each of the numbered surveys and personalised covering letters were individually printed from word-processing software (Microsoft Word) using 'mail merge' technology to match details and reference numbers with those appearing in individual records of the database.

The reference number which was to be the basis of subsequent data matching was printed in small type at the top left, below the heading (after the ## symbols in the reproductions which appear on the following pages.

The mailings of surveys were each printed onto different coloured paper, coded to enable returned surveys from different mailings to be distinguished. The first and second mailings in 1993 were printed on

cream paper and violet paper respectively, and in 1994 on gold-yellow paper and green paper respectively.

It is perhaps noteworthy that one survey form in 1993, and three in 1994, were returned with the randomly allocated identification number defaced, and since they could not be matched to the related record in the program data, these resposes could not be used and were set aside. They are not included in the data on resposes and response rates.

It seems probable that students who defaced the identifying number correctly inferred that the number was placed there for the purpose of matching their response with other data to be made available by the University, and wished to remain anonymous. It seems likely that these students misinterpreted the reference to 'not identifying individuals in the study' in the covering letter as implying total anonymity, and sought to ensure this. However, the preceding references (earlier in the same paragraph of the letter) to survey data being matched with student records, and to information being handled discreetly useing student numbers seem clear enough. In case students had interpreted the small size of the reference number to indicate an attempt to deceive them (it was in fact, originally printed in small type so as not to distract the student's gaze from the content which required her/his attention), the size of the reference number was increased for the last mailing.

The text of the questions used in 1993 and 1994 corresponded closely, however the layout was condensed slightly in 1994 to make room for a

seventh question (as explained in Chapter 4). A further refinement in 1994 was the addition of number codes in small print at the right of the tick boxes to facilitate data entry upon their return. Finally, references to the preceding year in the first question were updated to refer to 1993 (rather than 1992) in the 1994 surveys, and the year shown below the heading at the top of the page was also updated. In all other respects the content of the survey forms was identical.

The layout and content of the surveys used in each of the years of data collection for the program are reproduced on the following pages.

Figure 72. Reproduction of the format of the Questionnaire mailed in 1993.

TERTIARY ENTRANCE RESEARCH PROJECT

1993

##2.7.ref

1. *When did you complete Year 12 (VCE or equivalent) studies?*

   1992 ☐
   Before 1992 ☐
   Did not complete year 12 ☐

2. *Were your most recent secondary school subjects in the same areas as some of the subjects in the course you are now undertaking?*

   Mostly related ☐
   A mix of related and unrelated studies ☐
   Mostly unrelated ☐

3. *How much work (or voluntary) experience do you have in an area which is **CLOSELY RELATED** to the course you are now undertaking?*

   More than 5 years ☐
   2—5 years ☐
   1—2 years ☐
   Less than one year ☐
   None ☐

4. *How much work (or voluntary) experience do you have in an area which is **NOT CLOSELY RELATED** to the course you are now undertaking?*

   More than 5 years ☐
   2—5 years ☐
   1—2 years ☐
   Less than one year ☐
   None ☐

5. *What marks are you aiming for during your studies?*

   High grades ☐
   Better than pass ☐
   Happy to just pass everything ☐

6. *How long do you expect to take to complete your current course?*

   Up to twice minimum time (eg Part-Time study) or longer ☐
   A year or more extra beyond minimum time ☐
   Minimum time (eg 2 yrs for an Assoc. Diploma, 3 yrs for a degree) ☐
   Below minimum time (because of exemptions for previous studies) ☐

THANKYOU FOR PARTICIPATING IN THIS PROJECT.

PLEASE PLACE THE COMPLETED FORM IN THE RETURN ENVELOPE PROVIDED AND MAIL IT
(No Postage Stamp Required).

Figure 73. Reproduction of the format of the Questionnaire mailed in 1994.

TERTIARY ENTRANCE RESEARCH PROJECT

1994

##2.7.ref

1. *When did you complete Year 12 (VCE or equivalent) studies?*
   - 1993 ☐ 1
   - Before 1993 ☐ 2
   - Did not complete year 12 ☐ 3

2. *Were your most recent secondary school subjects in the same areas as some of the subjects in the course you are now undertaking?*
   - Mostly related ☐ 1
   - A mix of related and unrelated studies ☐ 2
   - Mostly unrelated ☐ 3

3. *How much work (or voluntary) experience do you have in an area which is **CLOSELY RELATED** to the course you are now undertaking?*
   - More than 5 years ☐ 1
   - 2—5 years ☐ 2
   - 1—2 years ☐ 3
   - Less than one year ☐ 4
   - None ☐ 5

4. *How much work (or voluntary) experience do you have in an area which is **NOT CLOSELY RELATED** to the course you are now undertaking?*
   - More than 5 years ☐ 1
   - 2—5 years ☐ 2
   - 1—2 years ☐ 3
   - Less than one year ☐ 4
   - None ☐ 5

5. *What marks are you aiming for during your studies?*
   - High grades ☐ 1
   - Better than pass ☐ 2
   - Happy to just pass everything ☐ 3

6. *How long do you expect to take to complete your current course?*
   - Up to twice minimum time (eg Part-Time study) or longer ☐ 1
   - A year or more extra beyond minimum time ☐ 2
   - Minimum time (eg 2 yrs for an Assoc. Diploma, 3 or 4 yrs for a degree) ☐ 3
   - Below minimum time (because of exemptions for previous studies) ☐ 4

7. *Please read through the list below and indicate (tick) any factors which may significantly influence your academic performance.*
   - Disability ☐ 1
   - Low income/financial difficulties ☐ 2
   - Childcare problems ☐ 3
   - English language difficulties ☐ 4

THANKYOU FOR PARTICIPATING IN THIS PROJECT.

PLEASE PLACE THE COMPLETED FORM IN THE RETURN ENVELOPE PROVIDED AND MAIL IT
(No Postage Stamp Required).

Part 15: Appendices.

Appendix 3.

The Approach to Respondents

Figure 74. Reproduction of the content and layout of the letters which were personalised, printed on University letterhead and accompanied the program surveys in both 1993 and 1994.

Admissions Research Project
Department of Education
JDW/mpb/rec
ID#
/Seq

{Date}

{Name and Address}

Dear {Name},

I am writing to invite you to participate in some exciting research into Higher Education being conducted in the Department of Education at the University. The project may assist in maximising opportunities for entry into University courses.

I am advised that you recently commenced studies in the {CseTitle} course, and therefore would be a suitable participant for this study. Very little is required of you to assist in our project, and I hope you will give it your attention for a few moments.

The research is seeking to establish the comparability of different backgrounds of applicants for admission to University, and may provide a basis for a review of tertiary entry requirements in the future.

The information you provide will be matched with student records data in the University to enable groups of commencing students to be profiled. Information will be handled discreetly using only student numbers, and individuals will not be identified in any way in the study.

If you are willing to participate, please answer the six questions on the attached page, and return it in the reply-paid envelope provided.

Yours sincerely,

Professor John D Wilson
Director of Research
Department of Education

Part 15: Appendices.

Appendix 4.

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The Programs

Two data analysis instruments have been created for the purposes of managing the information required for the program, and for deriving success indices from academic progress data. Both the databases have been programmed in FileMaker Pro v2.0 on Apple Macintosh computers, and are transportable to the Windows 3.x environment.

The two database programs interact dynamically to provide a platform for analysis and review of the range of information.

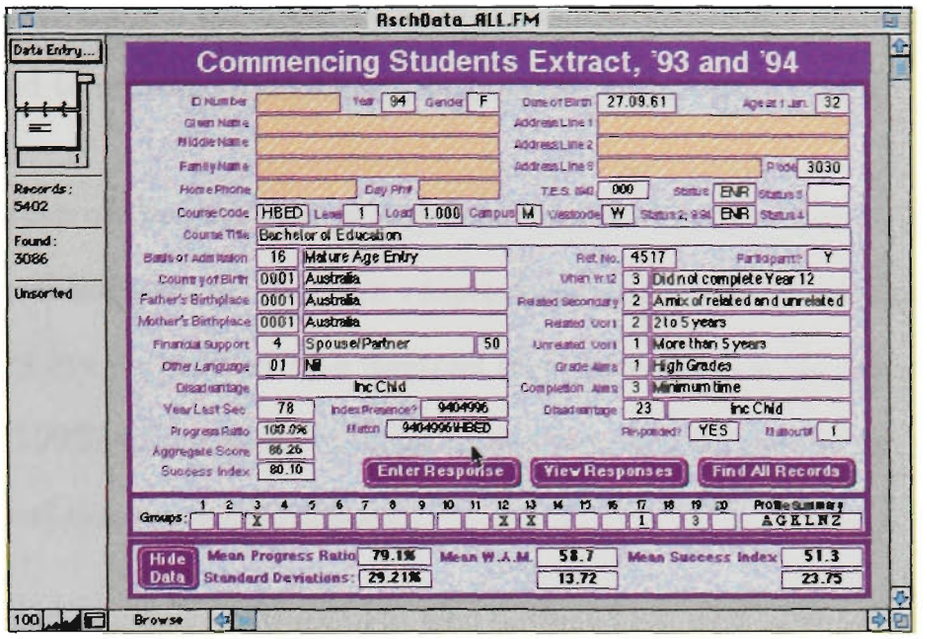
Database of Respondents

The first database holds detailed information about each of the 2,469 students who form the original target group for the program. This information includes the original set of enrolment and statistical data drawn from University records, as well as the full details of survey responses. The database is password protected to protect confidentiality, and match-fields are stored so that the records can be cross referenced to University records when necessary (eg to ascertain the students' current status).

The database of respondents (RschData_ALL.FM) provides 99 fields of data, summary and grouping information (full details of field definitions follow), and has two data views (data entry screens) and two report layouts, being a summary of responses and an address label report.

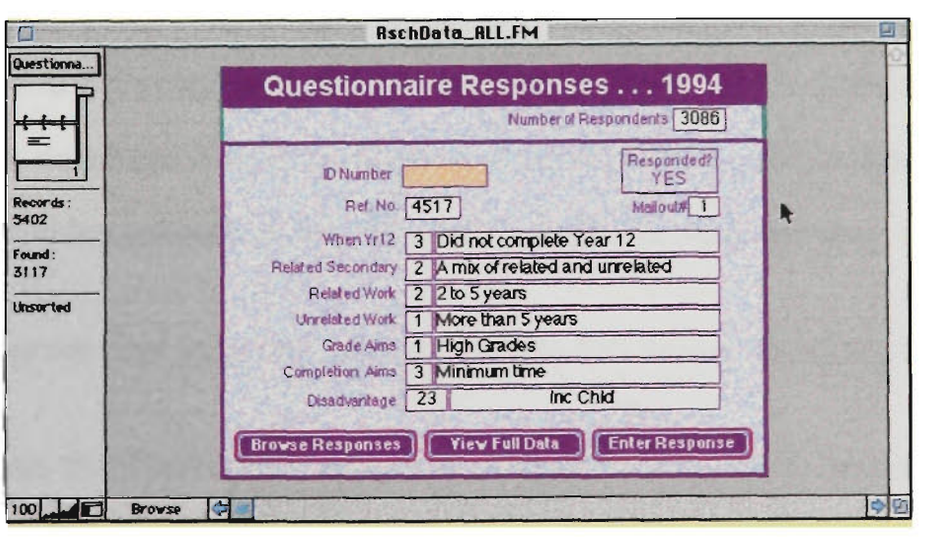
Figure 75 (below) shows the main data view screen which presents the available data set on each member of the target group. Name and address fields are ordinarily obscured although the data can be accessed if required for verification purposes. This was primarily used to identify and redirect mail where surveys were "returned to sender" for various reasons. For all other purposes, participants are identified by a reference number.

Figure 75: Data Entry and View screen



The program provides extensive criteria search capabilities, and summary data at the bottom of the screen give success index characteristics for the group currently being viewed. The above screen image in Figure 75 shows the summary data for the 3,086 participants, as well as providing a view of data for one respondent.

Figure 76: Questionnaire Responses screen



A second screen (Figure 76) provides both a data entry and review window to the survey data. Both buttons and command keys are provided to enable rapid movement through the procedures.

Every step of the program is automated and linked to menus and command buttons, so that the respondent status and questionnaire answers are calculated and derived from the seven numeric codes (six in 1993) which were entered to indicate the respondents' answers to each of the survey questions.

It should be noted that although student identification numbers and other identifying data were provided for the purposes of mailing and cross-checking with University records (including matching survey responses to subsequent academic results), these were not viewed or used as part of the research processes, and were blanked out on all screens and reports routinely used throughout the program (as shown by the orange shaded areas in Figures 75 and 76).

Database of Success Indices

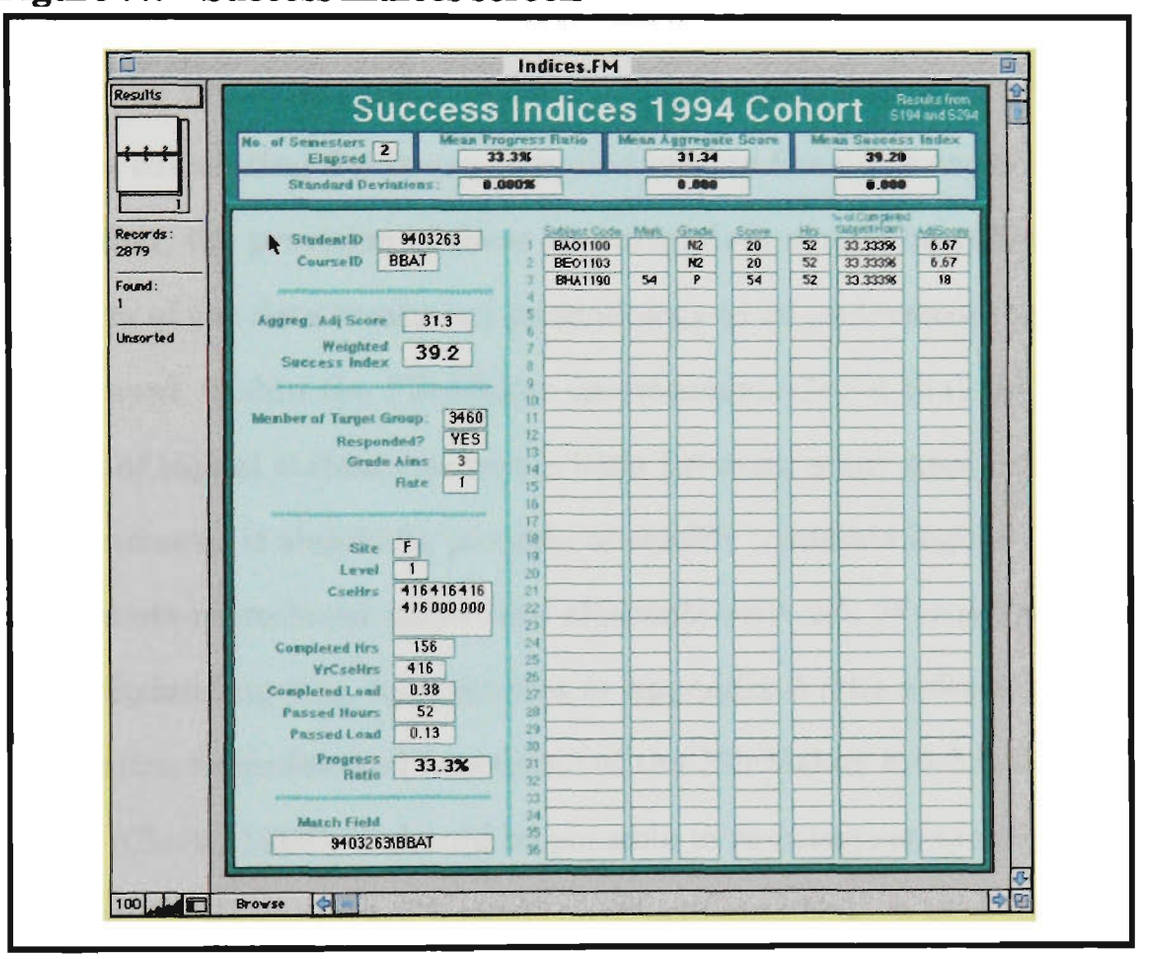
The second program is a special purpose module which draws data from the database above, matches it with students' results, and in turn, provides success index data back to the main database.

The program has only one screen (Figure 77) and a summary report.

Data from the University academic history records were imported from ASCII files, and then matched to subject and course details to arrive at subject component weights for each result and calculate a

weighted average mark (termed 'score' within the program code), as well as to calculate the progression quotient (progress index) for each student. These are then automatically matched to the students' stated grade aims and completion aims, to provide a goal adjusted success index for each student within the application.

Figure 77: Success Indices screen



Refinement and extension of the software was necessary throughout the course of the program (eg. to accommodate additional semester results). The basic design, however, was established and tested during the first two years of the program (1992 and 1993). The system is one which makes the extensive analysis and profiling requirements of the program possible in a streamlined, accurate and highly effective way.

Specifications

The printing function within the FileMaker Pro environment includes options which allow the printing of field and script definitions, and annotated copies of these have been provided for reference purposes in respect of the primary data management files developed within the program (see Figures 78 to 81 inclusive).

Whilst the syntax of functions from which the algorithms for the various calculating fields are compiled, varies from one environment to another, the provision of these technical data should be sufficient for parts of the data treatment methodology to be understood, and/or reproduced, within the FileMaker environment. Given that the syntax of logical statements varies little between many application environments, it should be possible to readily translate logical statements reproduced below into alternate software, if required. Notwithstanding this, by reference to Appendix A (the reference to calculation formulae and functions) of the FileMaker Pro 2.0 User Guide (Claris, 1992), it should be possible to re-interpret specifications for given fields as a set of logical constructs, and thus to port them elsewhere.

Figure 78. Technical data, programming data and file structure for research data master file (RschData_ALL.FM); index of fields for main table.

Field Name	Field Type	Description/Formulae/Entry Options
ID Number	Text	Imported Field from extract student data ASCII text file provided by the Univeristy (source file).
Given Name	Text	Imported from primary Univeristy (source file).
Family Name	Text	Imported from primary Univeristy (source file).
Address Line 1	Text	Imported from primary Univeristy (source file).
Address Line 2	Text	Imported from primary Univeristy (source file).

Address Line 3	Text	Imported from primary Univeristy (source file).
P'cde	Text	Imported from primary Univeristy (source file).
Course Code	Text	Imported from primary Univeristy (source file).
Campus	Text	Imported from primary Univeristy (source file).
Status	Text	Imported from primary Univeristy (source file).
Course Title	Text	Imported from primary Univeristy (source file).
Year of Course	Text	Imported from primary Univeristy (source file).
Load	Text	Imported from primary Univeristy (source file).
BasisAdmiss Code	Text	Lookup: "Basis of Admission" in "studat94.FM" when "ID Number" matches "StudentID" If no match, copy: "NtFnd"
Ctry of Bth Code	Text	Lookup: "Student's Country of Birth" in "studat94.FM" when "ID Number" matches "StudentID" If no match, copy: "NtFnd"
OthrLng Code	Text	Lookup: "Other Language 1" in "studat94.FM" when "ID Number" matches "StudentID" If no match, copy: "NtFnd"
FthBthPlce Code	Text	Lookup: "Father's Country of Birth" in "studat94.FM" when "ID Number" matches "StudentID" Don't copy contents if empty If no match, copy: "Don't Copy"
Middle Name	Text	Lookup: "Middle Name" in "mergdata94.FM" when "MatchField" matches "Matchfield" If no match, copy: "NtFnd"
Daytime Contact Phone	Number	Lookup: "Day\Wk Phone No." in "mergdata94.FM" when "MatchField" matches "Matchfield" If no match, copy: "NtFnd"
Home Phone	Number	Lookup: "Home Phone No." in "mergdata94.FM" when "MatchField" matches "Matchfield" If no match, copy: "NtFnd"
Fin Support Code	Number	Lookup: "Source of Financial Support" in "studat94.FM" when "ID Number" matches "StudentID" Don't Copy contents if empty If no match, copy: "Don't Copy"
MthBthPlce Code	Text	Lookup: "Mother's Country of Birth" in "studat94.FM" when "ID Number" matches "StudentID" Don't Copy contents if empty If no match, copy: "Don't Copy"

Disadvantage	Text	Lookup: "Disability Info" in "studat94.FM" when "ID Number" matches "StudentID" Don't Copy contents if empty If no match, copy: "Nil"
Father's Country of Birth	Text	Lookup: "Country" in "NewCount.FM" when "FthBthPlce Code" matches "'94Code" Don't Copy contents if empty If no match, copy: "NoMatch"
Mother's Country of Birth	Text	Lookup: "Country" in "NewCount.FM" when "MthBthPlce Code" matches "'94Code" Don't Copy contents if empty If no match, copy: "NoMatch"
Source of Financial Support	Text	Lookup: "Source of Financial Support" in "FinSupp.FM" when "Fin Support Code" matches "Code" Don't Copy contents if empty If no match, copy: "not found"
Country of Birth	Text	Lookup: "Country" in "NewCount.FM" when "Ctry of Bth Code" matches "'94Code" Don't Copy contents if empty If no match, copy: "NoMatch"
Basis of Admission	Text	Lookup: "Basis of Admission" in "BasisAdm.FM" when "BasisAdmiss Code" matches "Code" Don't Copy contents if empty If no match, copy: "error"
Other Language	Text	Lookup: "Language" in "NewLang.FM" when "OthrLng Code" matches "'94Code" Don't Copy contents if empty If no match, copy: "NoMatch"
MatchField	Calculation (Text)	= ID Number & "\" & Course Code
Status 2;9.94	Text	Lookup: "Status" in "MgDt0994.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NIL"
Ref. No.	Number	Randomly allocated four digit serial Numbers. Auto-enter:"" Prevent data that is automatically entered from being changed.
Q1	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "3"
Q2	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number"

		Only allow values in the range from "1" to "3"
Q3	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "5"
Q4	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "5"
Q5	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "3"
Q6	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "4"
When Yr12	Calculation (Text)	= If (Q1 = 1, "In 1993", If (Q1 = 2, "Before 1993", "Did not complete Year 12"))
Related Secondary	Calculation (Text)	= If (Q2 = 1, "Mostly related", If (Q2 = 2, "A mix of related and unrelated", "Unrelated"))
Related Work	Calculation (Text)	= If (Q3 = 1, "More than 5 years", If (Q3 = 2, "2 to 5 years", If (Q3 = 3, "1 to 2 years", If (Q3 = 4, "Less than one year", "None"))))
Unrelated Work	Calculation (Text)	= If (Q4 = 1, "more than 5 years", If (Q4 = 2, "2 to 5 years", If (Q4 = 3, "1 to 2 years", If (Q4 = 4, "Less than one year", "None"))))
Grade Aims	Calculation (Text)	= If (Q5 = 1, "High Grades", If (Q5 = 2, "Better than pass", "Happy just to pass"))
Completion Aims	Calculation (Text)	= If (Q6 = 1, "Twice minimum time or longer", If (Q6 = 2, "A year or more beyond minimum", If (Q6 = 3, "Minimum time", "Less than minimum time")))
Questionnaire Response	Calculation (Number)	= If (Q1 = "" and Q2 = "" and Q3 = "" and Q4 = "" and Q5 = "" and Q6 = "", 0,1)
Number of Respondents	Summary	= Total of Questionnaire Response
Gender	Text	Lookup: "Gender" in "MergData94.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "Nil"
Status 3	Text	Lookup: "Status" in "MgDt1094.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NIL"
Date of Birth	Date	Lookup: "Birth Date" in "MergData94.FM" when "MatchField" matches "MatchField"

		Don't copy contents if empty If no match, copy: "NtFnd"
Mailout#	Text	Data Entry Field for Questionnaire Responses
Aggregate Score	Number	Lookup: "Aggregate Score" in "Indices.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NtFnd"
Success Index	Number	Lookup: "Success Index" in "Indices.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NtFnd"
Progress Ratio	Number	Lookup: "Progress Ratio" in "Indices.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NtFnd"
Mean Score	Summary	= Average of Aggregate Score
Mean Success Index	Summary	= Average of Success Index
Status 4	Text	Lookup: "Status" in "MgDt1194.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NIL"
Year Last Secondary	Text	Lookup: "Last Year Attended Sec School" in "studat94.FM" when "ID Number" matches "StudentID" Don't copy contents if empty If no match, copy: "NtFnd"
Age at 1 Jan	Calculation (Number)	= Int ((Date (1, 1, (19 & Year)) - Date of Birth) / 365)
Std. Dev. Success Index	Summary	= Standard Deviation of Success Index
Q7	Number	Data Entry Field for Questionnaire Responses Only allow values of type: "Number" Only allow values in the range from "1" to "1234"
Mean Progress Ratio	Summary	= Average of Progress Ratio
Std. Dev. Progress Ratio	Summary	= Standard Deviation of Progress Ratio
Std. Dev. Aggregate Score	Summary	= Standard Deviation of Aggregate Score
Index Presence?	Text	Lookup: "StudentID" in "Indices.FM" when "MatchField" matches "MatchField" Don't copy contents if empty If no match, copy: "NotFound"

Year	Calculation (Text)	= If (ID) Number ≤ 9399999, "93", "94")
Westcode	Text	Lookup: "Western Region Code ?" in "Westcodes.FM" when "P'cde" matches "Postcode" Don't copy contents if empty If no match, copy: "N"
Motivation Weight	Calculation (Number)	= If (Q5 = "", 0, If (Q5 = 3, 15, If (Q5 = 2, 30, If (Q5 = 1, 45, ""))))
Motivation Mean	Summary	= Average of Motivation Weight
Mean Age	Summary	= Average of Age at 1 Jan
Participant?	Calculation (Text)	= If (Questionnaire Response = 0, "N", If(Index Presence? = "NotFound", "N", "Y"))
Equiv FinSupp Code	Text	Lookup: "Financial Support Group Code" in "FinSupp.FM" when "Fin Support Code" matches "Code" Don't copy contents if empty If no match, copy: "NtFnd"
cohort size [COB]	Number	Lookup: "Cohort Size" in "NewCount.FM" when "Ctry of Bth Code" matches "'94Code" Don't copy contents if empty If no match, copy: "not found"
Completion Aims Mean	Summary	= Average of Q6
Group 1	Text	Sample Group 1 membership flag field (flag = X)
Group 2	Text	Sample Group 2 membership flag field (flag = X)
Group 3	Text	Sample Group 3 membership flag field (flag = X)
Group 4	Text	Sample Group 4 membership flag field (flag = X)
Group 5	Text	Sample Group 5 membership flag field (flag = X)
Group 6	Text	Sample Group 6 membership flag field (flag = X)
Group 7	Text	Sample Group7 membership flag field (flag = X)
Group 8	Text	Sample Group 8 membership flag field (flag = X)
Group 9	Text	Sample Group 9 membership flag field (flag = X)
Group 10	Text	Sample Group 10 membership flag field (flag = X)
Group 11	Text	Sample Group 11 membership flag field (flag = X)
Group 12	Text	Sample Group 12 membership flag field (flag = X)
Group 13	Text	Sample Group 13 membership flag field (flag = X)
Group 14	Text	Sample Group 14 membership flag field (flag = X)
Group 15	Text	Sample Group 15 membership flag field (flag = X)
Group 16	Text	Sample Group 16 membership flag field (flag = X)

Group 17	Text	Group cluster 1 membership flag field (flag = 1)
Group 18	Text	Group cluster 2 membership flag field (flag = 2)
Group 19	Text	Group cluster 3 membership flag field (flag = 3)
Group 20	Text	Non-grouped participants flag field (flag = 4)
Profile Summary	Text	Flag Field for retrieval of profile indicator groups: A; Mature Age B; Part-time C; Male D; Born Overseas E; 1st Gen. Aust. F; Self Supported G; FamilySupport H; Austudy/Abstudy I; Govt/Org Suppoty J; Other Language spoken at home K; Disadvantaged (All) L; Low Income M; Language Difficulty N; Childcare Difficulty O; Disability
T.E.S. [94]	Number	Lookup: "T.E.S" in "RchDat94,FM" when "Match Field" matches "Match Field" Don't copy contents if empty If no match, copy: "N"
Female Flag	Calculation (Number)	= If (Gender = "F", 1, 0)
Male Flag	Calculation (Number)	= If (Gender = "M", 1, 0)
% Female	Summary	= Average of Female Flag
% Male	Summary	= Average of Male Flag

Figure 79. Real time routines, program sequences and scripts for research data master file (RschData_ALL.FM).

Script Step/Options	Script Procedures, Parameters, Etc.
SCRIPT NAME: **Find Responses**	
1. Perform Find (Restore Find Requests)	Request 1 Questionnaire Response 1
2. Go to Layout	Questionnaire Responses
3. Enter Browse Mode	END SCRIPT - EXIT TO MANUAL CONTROL

SCRIPT NAME: **View Data**	
1. Go to Layout	Data Entry
2. Enter Browse Mode	

SCRIPT NAME: **Enter Response**	
1. Go to Layout (Refresh screen)	Questionnaire Responses
2. Enter Find Mode	
3. Go to Field	Ref. No.
4. Pause/Resume Script	
5. Perform Find	Request 1 Questionnaire Response 1
6. Go to Field (Select/play)	Mailout#
7. Paste Literal	Data: 2
8. Go to Field	Q1

SCRIPT NAME: **Group 1 Find**	
1. Go to Layout	Data Entry
2. Enter Find Mode	
3. Go to Field (Select/play)	Questionnaire Response
4. Paste Literal	Data: YES
5. Go to Field (Select/play)	Q1
6. Paste Literal	Data: 1
7. Go to Field (Select/play)	Q2
8. Paste Literal	Data: 1
9. Pause/Resume Script	
10. Perform Find	

SCRIPT NAME: **Group 2 Find**	
1. Go to Layout	Data Entry
2. Enter Find Mode	
3. Go to Field (Select/play)	Questionnaire Response
4. Paste Literal	Data: YES
5. Go to Field (Select/play)	Q1
6. Paste Literal	Data: 1
7. Go to Field (Select/play)	Q2
8. Paste Literal	Data: 3
9. Pause/Resume Script	
10. Perform Find	

SCRIPT NAME: **Group3 Find**	
1. Go to Layout	Data Entry
2. Enter Find Mode	
3. Go to Field (Select/play)	Questionnaire Response
4. Paste Literal	Data: YES
5. Go to Field (Select/play)	Q1
6. Paste Literal	Data: 3
7. Go to Field (Select/play)	Q3
8. Paste Literal	Data: 1...2
9. Pause/Resume Script	
10. Perform Find	

SCRIPT NAME: **Group4 Find**	
1. Go to Layout	Data Entry
2. Enter Find Mode	

3. Go to Field (Select/play)	Questionnaire Response
4. Paste Literal	Data: YES
5. Go to Field (Select/play)	Q1
6. Paste Literal	Data: 3
7. Go to Field (Select/play)	Q3
8. Paste Literal	Data: >3
9. Go to Field (Select/play)	Q4
10. Paste Literal	Data: 1...2
11. Pause/Resume Script	
12. Perform Find	

SCRIPT NAME: **Group5 Find**	
1. Go to Layout	Data Entry
2. Enter Find Mode	
3. Go to Field (Select/play)	Questionnaire Response
4. Paste Literal	Data: YES
5. Go to Field (Select/play)	Q1
6. Paste Literal	Data: 1...2
7. Go to Field (Select/play)	Q2
8. Paste Literal	Data: 1
9. Go to Field (Select/play)	Q3
10. Paste Literal	Data: 2
11. Pause/Resume Script	
12. Perform Find	

Figure 80. Technical data, programming data and file structure for success indices feeder file (Indices.FM); index of fields for main table.

Field Name	Field Type	Description/Formulae/Entry Options
StudentID	Number	Imported Field from extract results data ASCII text file provided by the Univeristy (secondary source file).
CourseID	Text	
CodeSubj01	Text	
CodeSubj02	Text	
CodeSubj03	Text	
CodeSubj04	Text	
CodeSubj05	Text	
CodeSubj06	Text	
CodeSubj07	Text	
CodeSubj08	Text	
CodeSubj09	Text	
CodeSubj10	Text	
CodeSubj11	Text	
CodeSubj12	Text	
CodeSubj13	Text	
CodeSubj14	Text	
MarkSubj01	Number	
MarkSubj02	Number	
MarkSubj03	Number	
MarkSubj04	Number	
MarkSubj05	Number	
MarkSubj06	Number	
MarkSubj07	Number	
MarkSubj08	Number	
MarkSubj09	Number	
MarkSubj10	Number	
MarkSubj11	Number	
MarkSubj12	Number	
MarkSubj13	Number	
MarkSubj14	Number	
HrsSubj01	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj01" matches "Subject Code If no match, copy" "NtFnd"

HrsSubj02	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj02" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj03	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj03" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj04	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj04" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj05	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj05" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj06	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj06" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj07	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj07" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj08	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj08" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj09	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj09" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj10	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj10" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj1	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj11" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj12	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj12" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj13	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj13" matches "Subject Code If no match, copy" "NtFnd"
HrsSubj14	Text	Lookup: "Duration in "Subjects 1994.FM" when "CodeSubj14" matches "Subject Code If no match, copy" "NtFnd"
GradeSubj01	Text	
GradeSubj02	Text	
GradeSubj03	Text	
GradeSubj04	Text	
GradeSubj05	Text	
GradeSubj06	Text	
GradeSubj07	Text	

GradeSubj08	Text	
GradeSubj09	Text	
GradeSubj10	Text	
GradeSubj11	Text	
GradeSubj12	Text	
GradeSubj13	Text	
GradeSubj14	Text	

ScoreSubj01	Calculation (Text)	= If (MarkSubj01 ≠ "", MarkSubj01,
		If (GradeSubj01 = "HD" or GradeSubj01 = "H1", 90,
		If (GradeSubj01 = "D" or GradeSubj01 = "H2A", 75,
		If (GradeSubj01 = "S", 70,
		If (GradeSubj01 = "C" or GradeSubj01 = "H2B", 65,
		If (GradeSubj01 = "P" or GradeSubj01 = "H3", 55,
		If "GradeSubj01 = "N1", 45,
		If (GradeSubj01 = "N" or GradeSubj01 = "U", 25,
		If "GradeSubj01 = "N2", 20,
		"")))))))))

ScoreSubj02	Calculation (Text)	= If (MarkSubj02 ≠ "", MarkSubj02,
		If (GradeSubj02 = "HD" or GradeSubj02 = "H1", 90,
		If (GradeSubj02 = "D" or GradeSubj02 = "H2A", 75,
		If (GradeSubj02 = "S", 70,
		If (GradeSubj02 = "C" or GradeSubj02 = "H2B", 65,
		If (GradeSubj02 = "P" or GradeSubj02 = "H3", 55,
		If "GradeSubj02 = "N1", 45,
		If (GradeSubj02 = "N" or GradeSubj02 = "U", 25,
		If "GradeSubj02 = "N2", 20,
		"")))))))))

ScoreSubj03	Calculation (Text)	= If (MarkSubj03 ≠ "", MarkSubj03,
		If (GradeSubj03 = "HD" or GradeSubj03 = "H1", 90,
		If (GradeSubj03 = "D" or GradeSubj03 = "H2A", 75,
		If (GradeSubj03 = "S", 70,
		If (GradeSubj03 = "C" or GradeSubj03 = "H2B", 65,
		If (GradeSubj03 = "P" or GradeSubj03 = "H3", 55,
		If "GradeSubj03 = "N1", 45,
		If (GradeSubj03 = "N" or GradeSubj03 = "U", 25,
		If "GradeSubj03 = "N2", 20,
		"")))))))))

ScoreSubj04	Calculation (Text)	= If (MarkSubj04 ≠ "", MarkSubj04,
		If (GradeSubj04 = "HD" or GradeSubj04 = "H1", 90,
		If (GradeSubj04 = "D" or GradeSubj04 = "H2A", 75,
		If (GradeSubj04 = "S", 70,
		If (GradeSubj04 = "C" or GradeSubj04 = "H2B", 65,
		If (GradeSubj04 = "P" or GradeSubj04 = "H3", 55,
		If "GradeSubj04 = "N1", 45,
		If (GradeSubj04 = "N" or GradeSubj04 = "U", 25,
		If "GradeSubj04 = "N2", 20,
		"")))))))))

ScoreSubj05	Calculation (Text)	= If (MarkSubj05 ≠ "", MarkSubj05,
		If (GradeSubj05 = "HD" or GradeSubj05 = "H1", 90,
		If (GradeSubj05 = "D" or GradeSubj05 = "H2A", 75,
		If (GradeSubj05 = "S", 70,
		If (GradeSubj05 = "C" or GradeSubj05 = "H2B", 65,
		If (GradeSubj05 = "P" or GradeSubj05 = "H3", 55,
		If "GradeSubj05 = "N1", 45,
		If (GradeSubj05 = "N" or GradeSubj05 = "U", 25,
		If "GradeSubj05 = "N2", 20,
		""))))))))

ScoreSubj06	Calculation (Text)	= If (MarkSubj06 ≠ "", MarkSubj06,
		If (GradeSubj06 = "HD" or GradeSubj06 = "H1", 90,
		If (GradeSubj06 = "D" or GradeSubj06 = "H2A", 75,
		If (GradeSubj06 = "S", 70,
		If (GradeSubj06 = "C" or GradeSubj06 = "H2B", 65,
		If (GradeSubj06 = "P" or GradeSubj06 = "H3", 55,
		If "GradeSubj06 = "N1", 45,
		If (GradeSubj06 = "N" or GradeSubj06 = "U", 25,
		If "GradeSubj06 = "N2", 20,
		""))))))))

ScoreSubj07	Calculation (Text)	= If (MarkSubj07 ≠ "", MarkSubj07,
		If (GradeSubj07 = "HD" or GradeSubj07 = "H1", 90,
		If (GradeSubj07 = "D" or GradeSubj07 = "H2A", 75,
		If (GradeSubj07 = "S", 70,
		If (GradeSubj07 = "C" or GradeSubj07 = "H2B", 65,
		If (GradeSubj07 = "P" or GradeSubj07 = "H3", 55,
		If "GradeSubj07 = "N1", 45,
		If (GradeSubj07 = "N" or GradeSubj07 = "U", 25,
		If "GradeSubj07 = "N2", 20,
		""))))))))

ScoreSubj08	Calculation (Text)	= If (MarkSubj08 ≠ "", MarkSubj08,
		If (GradeSubj08 = "HD" or GradeSubj08 = "H1", 90,
		If (GradeSubj08 = "D" or GradeSubj08 = "H2A", 75,
		If (GradeSubj08 = "S", 70,
		If (GradeSubj08 = "C" or GradeSubj08 = "H2B", 65,
		If (GradeSubj08 = "P" or GradeSubj08 = "H3", 55,
		If "GradeSubj08 = "N1", 45,
		If (GradeSubj08 = "N" or GradeSubj08 = "U", 25,
		If "GradeSubj08 = "N2", 20,
		""))))))))

ScoreSubj09	Calculation (Text)	= If (MarkSubj09 ≠ "", MarkSubj01,
		If (GradeSubj09 = "HD" or GradeSubj09 = "H1", 90,
		If (GradeSubj09 = "D" or GradeSubj09 = "H2A", 75,
		If (GradeSubj09 = "S", 70,
		If (GradeSubj09 = "C" or GradeSubj09 = "H2B", 65,
		If (GradeSubj09 = "P" or GradeSubj09 = "H3", 55,
		If "GradeSubj09 = "N1", 45,
		If (GradeSubj09 = "N" or GradeSubj09 = "U", 25,
		If "GradeSubj09 = "N2", 20,
		""))))))))

ScoreSubj10	Calculation (Text)	= If (MarkSubj10 ≠ "", MarkSubj10,
		If (GradeSubj10 = "HD" or GradeSubj10 = "H1", 90,
		If (GradeSubj10 = "D" or GradeSubj10 = "H2A", 75,
		If (GradeSubj10 = "S", 70,
		If (GradeSubj10 = "C" or GradeSubj10 = "H2B", 65,
		If (GradeSubj10 = "P" or GradeSubj10 = "H3", 55,
		If "GradeSubj10 = "N1", 45,
		If (GradeSubj10 = "N" or GradeSubj10 = "U", 25,
		If "GradeSubj10 = "N2", 20,
		""))))))))

ScoreSubj11	Calculation (Text)	= If (MarkSubj11 ≠ "", MarkSubj11,
		If (GradeSubj11 = "HD" or GradeSubj11 = "H1", 90,
		If (GradeSubj11 = "D" or GradeSubj11 = "H2A", 75,
		If (GradeSubj11 = "S", 70,
		If (GradeSubj11 = "C" or GradeSubj11 = "H2B", 65,
		If (GradeSubj11 = "P" or GradeSubj11 = "H3", 55,
		If "GradeSubj11 = "N1", 45,
		If (GradeSubj11 = "N" or GradeSubj11 = "U", 25,
		If "GradeSubj11 = "N2", 20,
		""))))))))

ScoreSubj12	Calculation (Text)	= If (MarkSubj12 ≠ "", MarkSubj12,
		If (GradeSubj12 = "HD" or GradeSubj12 = "H1", 90,
		If (GradeSubj12 = "D" or GradeSubj12 = "H2A", 75,
		If (GradeSubj12 = "S", 70,
		If (GradeSubj12 = "C" or GradeSubj12 = "H2B", 65,
		If (GradeSubj12 = "P" or GradeSubj12 = "H3", 55,
		If "GradeSubj12 = "N1", 45,
		If (GradeSubj12 = "N" or GradeSubj12 = "U", 25,
		If "GradeSubj12 = "N2", 20,
		""))))))))

ScoreSubj13	Calculation (Text)	= If (MarkSubj13 ≠ "", MarkSubj13,
		If (GradeSubj13 = "HD" or GradeSubj13 = "H1", 90,
		If (GradeSubj13 = "D" or GradeSubj13 = "H2A", 75,
		If (GradeSubj13 = "S", 70,
		If (GradeSubj13 = "C" or GradeSubj13 = "H2B", 65,
		If (GradeSubj13 = "P" or GradeSubj13 = "H3", 55,
		If "GradeSubj13 = "N1", 45,
		If (GradeSubj13 = "N" or GradeSubj13 = "U", 25,
		If "GradeSubj13 = "N2", 20,
		""))))))))

ScoreSubj14	Calculation (Text)	= If (MarkSubj14 ≠ "", MarkSubj14,
		If (GradeSubj14 = "HD" or GradeSubj14 = "H1", 90,
		If (GradeSubj14 = "D" or GradeSubj14 = "H2A", 75,
		If (GradeSubj14 = "S", 70,
		If (GradeSubj14 = "C" or GradeSubj14 = "H2B", 65,
		If (GradeSubj14 = "P" or GradeSubj14 = "H3", 55,
		If "GradeSubj14 = "N1", 45,
		If (GradeSubj14 = "N" or GradeSubj14 = "U", 25,
		If "GradeSubj14 = "N2", 20,
		""))))))))

Load%Subj01	Calculation (Text)	= If (GradeSubj01 = "HD" or GradeSubj01 = "H1" or GradeSubj01 = "D" or GradeSubj01 = "H2A" or GradeSubj01 = "C" or GradeSubj01 = "H2B" or GradeSubj01 = "P" or GradeSubj01 = "H3" or GradeSubj01 = "S" or GradeSubj01 = "N1" or

		GradeSubj01 = "N" or GradeSubj01 = "U" or GradeSubj01 = "N2", Round(HrsSubj01 / Completed Hours * 100,3) & "%","")
Load%Subj02	Calculation (Text)	= If (GradeSubj02 = "HD" or GradeSubj02 = "H1" or GradeSubj02 = "D" or GradeSubj02 = "H2A" or GradeSubj02 = "C" or GradeSubj02 = "H2B" or GradeSubj02 = "P" or GradeSubj02 = "H3" or GradeSubj02 = "S" or GradeSubj02 = "N1" or GradeSubj02 = "N" or GradeSubj02 = "U" or GradeSubj02 = "N2", Round(HrsSubj02 / Completed Hours * 100,3) & "%","")
Load%Subj03	Calculation (Text)	= If (GradeSubj03 = "HD" or GradeSubj03 = "H1" or GradeSubj03 = "D" or GradeSubj03 = "H2A" or GradeSubj03 = "C" or GradeSubj03 = "H2B" or GradeSubj03 = "P" or GradeSubj03 = "H3" or GradeSubj03 = "S" or GradeSubj03 = "N1" or GradeSubj03 = "N" or GradeSubj03 = "U" or GradeSubj03 = "N2", Round(HrsSubj03 / Completed Hours * 100,3) & "%","")
Load%Subj04	Calculation (Text)	= If (GradeSubj04 = "HD" or GradeSubj04 = "H1" or GradeSubj04 = "D" or GradeSubj04 = "H2A" or GradeSubj04 = "C" or GradeSubj04 = "H2B" or GradeSubj04 = "P" or GradeSubj04 = "H3" or GradeSubj04 = "S" or GradeSubj04 = "N1" or GradeSubj04 = "N" or GradeSubj04 = "U" or GradeSubj04 = "N2", Round(HrsSubj04 / Completed Hours * 100,3) & "%","")
Load%Subj05	Calculation (Text)	= If (GradeSubj05 = "HD" or GradeSubj05 = "H1" or GradeSubj05 = "D" or GradeSubj05 = "H2A" or GradeSubj05 = "C" or GradeSubj05 = "H2B" or GradeSubj05 = "P" or GradeSubj05 = "H3" or GradeSubj05 = "S" or GradeSubj05 = "N1" or GradeSubj05 = "N" or GradeSubj05 = "U" or GradeSubj05 = "N2", Round(HrsSubj05 / Completed Hours * 100,3) & "%","")
Load%Subj06	Calculation (Text)	= If (GradeSubj06 = "HD" or GradeSubj06 = "H1" or GradeSubj06 = "D" or GradeSubj06 = "H2A" or GradeSubj06 = "C" or GradeSubj06 = "H2B" or GradeSubj06 = "P" or GradeSubj06 = "H3" or GradeSubj06 = "S" or GradeSubj06 = "N1" or GradeSubj06 = "N" or GradeSubj06 = "U" or GradeSubj06 = "N2", Round(HrsSubj06 / Completed Hours * 100,3) & "%","")
Load%Subj07	Calculation (Text)	= If (GradeSubj07 = "HD" or GradeSubj07 = "H1" or GradeSubj07 = "D" or GradeSubj07 = "H2A" or GradeSubj07 = "C" or GradeSubj07 = "H2B" or GradeSubj07 = "P" or GradeSubj07 = "H3" or GradeSubj07 = "S" or GradeSubj07 = "N1" or GradeSubj07 = "N" or GradeSubj07 = "U" orGradeSubj07 = "N2", Round(HrsSubj07 / Completed Hours * 100,3) & "%","")
Load%Subj08	Calculation (Text)	= If (GradeSubj08 = "HD" or GradeSubj08 = "H1" or GradeSubj08 = "D" or GradeSubj08 = "H2A" or GradeSubj08 = "C" or GradeSubj08 = "H2B" or

		GradeSubj08 = "P" or GradeSubj08 = "H3" or GradeSubj08 = "S" or GradeSubj08 = "N1" or GradeSubj08 = "N" or GradeSubj08 = "U" or GradeSubj08 = "N2", Round(HrsSubj08 / Completed Hours * 100,3) & "%","")
Load%Subj09	Calculation (Text)	= If (GradeSubj09 = "HD" or GradeSubj09 = "H1" or GradeSubj09 = "D" or GradeSubj09 = "H2A" or GradeSubj09 = "C" or GradeSubj09 = "H2B" or GradeSubj09 = "P" or GradeSubj09 = "H3" or GradeSubj09 = "S" or GradeSubj09 = "N1" or GradeSubj09 = "N" or GradeSubj09 = "U" or GradeSubj09 = "N2", Round(HrsSubj09 / Completed Hours * 100,3) & "%","")
Load%Subj10	Calculation (Text)	= If (GradeSubj10 = "HD" or GradeSubj10 = "H1" or GradeSubj10 = "D" or GradeSubj10 = "H2A" or GradeSubj10 = "C" or GradeSubj10 = "H2B" or GradeSubj10 = "P" or GradeSubj10 = "H3" or GradeSubj10 = "S" or GradeSubj10 = "N1" or GradeSubj10 = "N" or GradeSubj10 = "U" or GradeSubj10 = "N2", Round(HrsSubj10 / Completed Hours * 100,3) & "%","")
Load%Subj11	Calculation (Text)	= If (GradeSubj11 = "HD" or GradeSubj11 = "H1" or GradeSubj11 = "D" or GradeSubj11 = "H2A" or GradeSubj11 = "C" or GradeSubj11 = "H2B" or GradeSubj11 = "P" or GradeSubj11 = "H3" or GradeSubj11 = "S" or GradeSubj11 = "N1" or GradeSubj11 = "N" or GradeSubj11 = "U" or GradeSubj11 = "N2", Round(HrsSubj11 / Completed Hours * 100,3) & "%","")
Load%Subj12	Calculation (Text)	= If (GradeSubj12 = "HD" or GradeSubj12 = "H1" or GradeSubj12 = "D" or GradeSubj12 = "H2A" or GradeSubj12 = "C" or GradeSubj12 = "H2B" or GradeSubj12 = "P" or GradeSubj12 = "H3" or GradeSubj12 = "S" or GradeSubj12 = "N1" or GradeSubj12 = "N" or GradeSubj12 = "U" or GradeSubj12 = "N2", Round(HrsSubj12 / Completed Hours * 100,3) & "%","")
Load%Subj13	Calculation (Text)	= If (GradeSubj13 = "HD" or GradeSubj13 = "H1" or GradeSubj13 = "D" or GradeSubj13 = "H2A" or GradeSubj13 = "C" or GradeSubj13 = "H2B" or GradeSubj13 = "P" or GradeSubj13 = "H3" or GradeSubj13 = "S" or GradeSubj13 = "N1" or GradeSubj13 = "N" or GradeSubj13 = "U" or GradeSubj13 = "N2", Round(HrsSubj13 / Completed Hours * 100,3) & "%","")
Load%Subj14	Calculation (Text)	= If (GradeSubj14 = "HD" or GradeSubj14 = "H1" or GradeSubj14 = "D" or GradeSubj14 = "H2A" or GradeSubj14 = "C" or GradeSubj14 = "H2B" or GradeSubj14 = "P" or GradeSubj14 = "H3" or GradeSubj14 = "S" or GradeSubj14 = "N1" or GradeSubj14 = "N" or GradeSubj14 = "U" or GradeSubj14 = "N2", Round(HrsSubj14 / Completed Hours * 100,3) & "%","")

AdjScoreSubj01	Calculation (Text)	= If (Load%Subj01 = "", "", Round(ScoreSubj01 * Load%Subj01 / 100, 2))
AdjScoreSubj02	Calculation (Text)	= If (Load%Subj02 = "", "", Round(ScoreSubj02 * Load%Subj02 / 100, 2))
AdjScoreSubj03	Calculation (Text)	= If (Load%Subj03 = "", "", Round(ScoreSubj03 * Load%Subj03 / 100, 2))
AdjScoreSubj04	Calculation (Text)	= If (Load%Subj04 = "", "", Round(ScoreSubj04 * Load%Subj04 / 100, 2))
AdjScoreSubj05	Calculation (Text)	= If (Load%Subj05 = "", "", Round(ScoreSubj05 * Load%Subj05 / 100, 2))
AdjScoreSubj06	Calculation (Text)	= If (Load%Subj06 = "", "", Round(ScoreSubj06 * Load%Subj06 / 100, 2))
AdjScoreSubj07	Calculation (Text)	= If (Load%Subj07 = "", "", Round(ScoreSubj07 * Load%Subj07 / 100, 2))
AdjScoreSubj08	Calculation (Text)	= If (Load%Subj08 = "", "", Round(ScoreSubj08 * Load%Subj08 / 100, 2))
AdjScoreSubj09	Calculation (Text)	= If (Load%Subj09 = "", "", Round(ScoreSubj09 * Load%Subj09 / 100, 2))
AdjScoreSubj10	Calculation (Text)	= If (Load%Subj10 = "", "", Round(ScoreSubj10 * Load%Subj10 / 100, 2))
AdjScoreSubj11	Calculation (Text)	= If (Load%Subj11 = "", "", Round(ScoreSubj11 * Load%Subj11 / 100, 2))
AdjScoreSubj12	Calculation (Text)	= If (Load%Subj12 = "", "", Round(ScoreSubj12 * Load%Subj12 / 100, 2))
AdjScoreSubj13	Calculation (Text)	= If (Load%Subj13 = "", "", Round(ScoreSubj13 * Load%Subj13 / 100, 2))
AdjScoreSubj14	Calculation (Text)	= If (Load%Subj14 = "", "", Round(ScoreSubj14 * Load%Subj14 / 100, 2))
CodeSubj15	Text	
CodeSubj16	Text	
CodeSubj17	Text	
CodeSubj18	Text	
CodeSubj19	Text	
CodeSubj20	Text	
CodeSubj21	Text	
CodeSubj22	Text	
CodeSubj23	Text	
CodeSubj24	Text	
CodeSubj25	Text	
CodeSubj26	Text	
CodeSubj27	Text	
CodeSubj28	Text	

CodeSubj29	Text	
CodeSubj30	Text	
CodeSubj31	Text	
CodeSubj32	Text	
CodeSubj33	Text	
CodeSubj34	Text	
CodeSubj35	Text	
CodeSubj36	Text	
MarkSubj15	Number	
MarkSubj16	Number	
MarkSubj17	Number	
MarkSubj18	Number	
MarkSubj19	Number	
MarkSubj20	Number	
MarkSubj21	Number	
MarkSubj22	Number	
MarkSubj23	Number	
MarkSubj24	Number	
MarkSubj25	Number	
MarkSubj26	Number	
MarkSubj27	Number	
MarkSubj28	Number	
MarkSubj29	Number	
MarkSubj30	Number	
MarkSubj31	Number	
MarkSubj32	Number	
MarkSubj33	Number	
MarkSubj34	Number	
MarkSubj35	Number	
MarkSubj36	Number	
GradeSubj15	Text	
GradeSubj16	Text	
GradeSubj17	Text	
GradeSubj18	Text	
GradeSubj19	Text	
GradeSubj20	Text	
GradeSubj21	Text	

GradeSubj22	Text	
GradeSubj23	Text	
GradeSubj24	Text	
GradeSubj25	Text	
GradeSubj26	Text	
GradeSubj27	Text	
GradeSubj28	Text	
GradeSubj29	Text	
GradeSubj30	Text	
GradeSubj31	Text	
GradeSubj32	Text	
GradeSubj33	Text	
GradeSubj34	Text	
GradeSubj35	Text	
GradeSubj36	Text	
HrsSubj15	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj15" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj16	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj16" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj17	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj17" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj18	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj18" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj19	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj19" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj20	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj20" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj21	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj21" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj22	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj22" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj23	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj23" matches "Subject Code" If no match, copy: "NtFnd"

HrsSubj24	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj24" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj25	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj25" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj26	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj26" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj27	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj27" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj28	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj28" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj29	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj29" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj30	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj30" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj31	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj31" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj32	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj32" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj33	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj33" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj34	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj34" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj35	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj35" matches "Subject Code" If no match, copy: "NtFnd"
HrsSubj36	Text	Lookup: "Duration" in "Subjects 1994.FM" when "CodeSubj36" matches "Subject Code" If no match, copy: "NtFnd"

ScoreSubj15	Calculation (Text)	= If (MarkSubj15 ≠ "", MarkSubj15,
		If (GradeSubj15 = "HD" or GradeSubj15 = "H1", 90,
		If (GradeSubj15 = "D" or GradeSubj15 = "H2A",
		75,
		If (GradeSubj15 = "S", 70,
		If (GradeSubj15 = "C" or GradeSubj15 = "H2B", 65,
		If (GradeSubj15 = "P" or GradeSubj15 = "H3", 55,
		If "GradeSubj15 = "N1", 45,
		If (GradeSubj15 = "N" or GradeSubj15 = "U", 25,
		If (GradeSubj15 = "N2", 20,
		""))))))))

ScoreSubj16	Calculation (Text)	= If (MarkSubj16 ≠ "", MarkSubj16,
		If (GradeSubj16 = "HD" or GradeSubj16 = "H1", 90,
		If (GradeSubj16 = "D" or GradeSubj16 = "H2A",
		75,
		If (GradeSubj16 = "S", 70,
		If (GradeSubj16 = "C" or GradeSubj16 = "H2B", 65,
		If (GradeSubj16 = "P" or GradeSubj16 = "H3", 55,
		If "GradeSubj16 = "N1", 45,
		If (GradeSubj16 = "N" or GradeSubj16 = "U", 25,
		If (GradeSubj16 = "N2", 20,
		""))))))))

ScoreSubj17	Calculation (Text)	= If (MarkSubj17 ≠ "", MarkSubj17,
		If (GradeSubj17 = "HD" or GradeSubj17 = "H1", 90,
		If (GradeSubj17 = "D" or GradeSubj17 = "H2A",
		75,
		If (GradeSubj17 = "S", 70,
		If (GradeSubj17 = "C" or GradeSubj17 = "H2B", 65,
		If (GradeSubj17 = "P" or GradeSubj17 = "H3", 55,
		If "GradeSubj17 = "N1", 45,
		If (GradeSubj17 = "N" or GradeSubj17 = "U", 25,
		If (GradeSubj17 = "N2", 20,
		""))))))))

ScoreSubj18	Calculation (Text)	= If (MarkSubj18 ≠ "", MarkSubj18,
		If (GradeSubj18 = "HD" or GradeSubj18 = "H1", 90,
		If (GradeSubj18 = "D" or GradeSubj18 = "H2A",
		75,
		If (GradeSubj18 = "S", 70,
		If (GradeSubj18 = "C" or GradeSubj18 = "H2B", 65,
		If (GradeSubj18 = "P" or GradeSubj18 = "H3", 55,
		If "GradeSubj18 = "N1", 45,
		If (GradeSubj18 = "N" or GradeSubj18 = "U", 25,
		If (GradeSubj18 = "N2", 20,
		""))))))))

ScoreSubj19	Calculation (Text)	= If (MarkSubj19 ≠ "", MarkSubj19,
		If (GradeSubj19 = "HD" or GradeSubj19 = "H1", 90,
		If (GradeSubj19 = "D" or GradeSubj19 = "H2A",
		75,
		If (GradeSubj19 = "S", 70,
		If (GradeSubj19 = "C" or GradeSubj19 = "H2B", 65,
		If (GradeSubj19 = "P" or GradeSubj19 = "H3", 55,
		If "GradeSubj19 = "N1", 45,
		If (GradeSubj19 = "N" or GradeSubj19 = "U", 25,
		If (GradeSubj19 = "N2", 20,
		""))))))))

ScoreSubj20	Calculation (Text)	= If (MarkSubj20 ≠ "", MarkSubj20,
		If (GradeSubj20 = "HD" or GradeSubj20 = "H1", 90,
		If (GradeSubj20 = "D" or GradeSubj20 = "H2A",
		75,
		If (GradeSubj20 = "S", 70,
		If (GradeSubj20 = "C" or GradeSubj20 = "H2B", 65,
		If (GradeSubj20 = "P" or GradeSubj20 = "H3", 55,
		If "GradeSubj20 = "N1", 45,
		If (GradeSubj20 = "N" or GradeSubj20 = "U", 25,
		If (GradeSubj20 = "N2", 20,
		""))))))))

ScoreSubj21	Calculation (Text)	= If (MarkSubj21 ≠ "", MarkSubj21,
		If (GradeSubj21 = "HD" or GradeSubj21 = "H1", 90,
		If (GradeSubj21 = "D" or GradeSubj21 = "H2A",
		75,
		If (GradeSubj21 = "S", 70,
		If (GradeSubj21 = "C" or GradeSubj21 = "H2B", 65,
		If (GradeSubj21 = "P" or GradeSubj21 = "H3", 55,
		If "GradeSubj21 = "N1", 45,
		If (GradeSubj21 = "N" or GradeSubj21 = "U", 25,
		If (GradeSubj21 = "N2", 20,
		""))))))))

ScoreSubj22	Calculation (Text)	= If (MarkSubj22 ≠ "", MarkSubj22,
		If (GradeSubj22 = "HD" or GradeSubj22 = "H1", 90,
		If (GradeSubj22 = "D" or GradeSubj22 = "H2A",
		75,
		If (GradeSubj22 = "S", 70,
		If (GradeSubj22 = "C" or GradeSubj22 = "H2B", 65,
		If (GradeSubj22 = "P" or GradeSubj22 = "H3", 55,
		If "GradeSubj22 = "N1", 45,
		If (GradeSubj22 = "N" or GradeSubj22 = "U", 25,
		If (GradeSubj22 = "N2", 20,
		""))))))))

ScoreSubj23	Calculation (Text)	= If (MarkSubj23 ≠ "", MarkSubj23,
		If (GradeSubj23 = "HD" or GradeSubj23 = "H1", 90,
		If (GradeSubj23 = "D" or GradeSubj23 = "H2A",
		75,
		If (GradeSubj23 = "S", 70,
		If (GradeSubj23 = "C" or GradeSubj23 = "H2B", 65,
		If (GradeSubj23 = "P" or GradeSubj23 = "H3", 55,
		If "GradeSubj23 = "N1", 45,
		If (GradeSubj23 = "N" or GradeSubj23 = "U", 25,
		If (GradeSubj23 = "N2", 20,
		""))))))))

ScoreSubj24	Calculation (Text)	= If (MarkSubj24 ≠ "", MarkSubj24,
		If (GradeSubj24 = "HD" or GradeSubj24 = "H1", 90,
		If (GradeSubj24 = "D" or GradeSubj24 = "H2A",
		75,
		If (GradeSubj24 = "S", 70,
		If (GradeSubj24 = "C" or GradeSubj24 = "H2B", 65,
		If (GradeSubj24 = "P" or GradeSubj24 = "H3", 55,
		If "GradeSubj24 = "N1", 45,
		If (GradeSubj24 = "N" or GradeSubj24 = "U", 25,
		If (GradeSubj24 = "N2", 20,
		""))))))))

ScoreSubj25	Calculation (Text)	= If (MarkSubj25 ≠ "", MarkSubj25,
		If (GradeSubj25 = "HD" or GradeSubj25 = "H1", 90,
		If (GradeSubj25 = "D" or GradeSubj25 = "H2A",
		75,
		If (GradeSubj25 = "S", 70,
		If (GradeSubj25 = "C" or GradeSubj25 = "H2B", 65,
		If (GradeSubj25 = "P" or GradeSubj25 = "H3", 55,
		If "GradeSubj25 = "N1", 45,
		If (GradeSubj25 = "N" or GradeSubj25 = "U", 25,
		If (GradeSubj25 = "N2", 20,
		""))))))))

ScoreSubj26	Calculation (Text)	= If (MarkSubj26 ≠ "", MarkSubj26,
		If (GradeSubj26 = "HD" or GradeSubj26 = "H1", 90,
		If (GradeSubj26 = "D" or GradeSubj26 = "H2A",
		75,
		If (GradeSubj26 = "S", 70,
		If (GradeSubj26 = "C" or GradeSubj26 = "H2B", 65,
		If (GradeSubj26 = "P" or GradeSubj26 = "H3", 55,
		If "GradeSubj26 = "N1", 45,
		If (GradeSubj26 = "N" or GradeSubj26 = "U", 25,
		If (GradeSubj26 = "N2", 20,
		""))))))))

ScoreSubj27	Calculation (Text)	= If (MarkSubj27 ≠ "", MarkSubj27,
		If (GradeSubj27 = "HD" or GradeSubj27 = "H1", 90,
		If (GradeSubj27 = "D" or GradeSubj27 = "H2A",
		75,
		If (GradeSubj27 = "S", 70,
		If (GradeSubj27 = "C" or GradeSubj27 = "H2B", 65,
		If (GradeSubj27 = "P" or GradeSubj27 = "H3", 55,
		If "GradeSubj27 = "N1", 45,
		If (GradeSubj27 = "N" or GradeSubj27 = "U", 25,
		If (GradeSubj27 = "N2", 20,
		""))))))))

ScoreSubj28	Calculation (Text)	= If (MarkSubj28 ≠ "", MarkSubj28,
		If (GradeSubj28 = "HD" or GradeSubj28 = "H1", 90,
		If (GradeSubj28 = "D" or GradeSubj28 = "H2A",
		75,
		If (GradeSubj28 = "S", 70,
		If (GradeSubj28 = "C" or GradeSubj28 = "H2B", 65,
		If (GradeSubj28 = "P" or GradeSubj28 = "H3", 55,
		If "GradeSubj28 = "N1", 45,
		If (GradeSubj28 = "N" or GradeSubj28 = "U", 25,
		If (GradeSubj28 = "N2", 20,
		""))))))))

ScoreSubj29	Calculation (Text)	= If (MarkSubj29 ≠ "", MarkSubj29,
		If (GradeSubj29 = "HD" or GradeSubj29 = "H1", 90,
		If (GradeSubj29 = "D" or GradeSubj29 = "H2A",
		75,
		If (GradeSubj29 = "S", 70,
		If (GradeSubj29 = "C" or GradeSubj29 = "H2B", 65,
		If (GradeSubj29 = "P" or GradeSubj29 = "H3", 55,
		If "GradeSubj29 = "N1", 45,
		If (GradeSubj29 = "N" or GradeSubj29 = "U", 25,
		If (GradeSubj29 = "N2", 20,
		""))))))))

ScoreSubj30	Calculation (Text)	= If (MarkSubj30 ≠ "", MarkSubj30,
		If (GradeSubj30 = "HD" or GradeSubj30 = "H1", 90,
		If (GradeSubj30 = "D" or GradeSubj30 = "H2A",
		75,
		If (GradeSubj30 = "S", 70,
		If (GradeSubj30 = "C" or GradeSubj30 = "H2B", 65,
		If (GradeSubj30 = "P" or GradeSubj30 = "H3", 55,
		If "GradeSubj30 = "N1", 45,
		If (GradeSubj30 = "N" or GradeSubj30 = "U", 25,
		If (GradeSubj30 = "N2", 20,
		""))))))))

ScoreSubj31	Calculation (Text)	= If (MarkSubj31 ≠ "", MarkSubj31,
		If (GradeSubj31 = "HD" or GradeSubj31 = "H1", 90,
		If (GradeSubj31 = "D" or GradeSubj31 = "H2A",
		75,
		If (GradeSubj31 = "S", 70,
		If (GradeSubj31 = "C" or GradeSubj31 = "H2B", 65,
		If (GradeSubj31 = "P" or GradeSubj31 = "H3", 55,
		If "GradeSubj31 = "N1", 45,
		If (GradeSubj31 = "N" or GradeSubj31 = "U", 25,
		If (GradeSubj31 = "N2", 20,
		""))))))))

ScoreSubj32	Calculation (Text)	= If (MarkSubj32 ≠ "", MarkSubj32,
		If (GradeSubj32 = "HD" or GradeSubj32 = "H1", 90,
		If (GradeSubj32 = "D" or GradeSubj32 = "H2A",
		75,
		If (GradeSubj32 = "S", 70,
		If (GradeSubj32 = "C" or GradeSubj32 = "H2B", 65,
		If (GradeSubj32 = "P" or GradeSubj32 = "H3", 55,
		If "GradeSubj32 = "N1", 45,
		If (GradeSubj32 = "N" or GradeSubj32 = "U", 25,
		If (GradeSubj32 = "N2", 20,
		""))))))))

ScoreSubj33	Calculation (Text)	= If (MarkSubj33 ≠ "", MarkSubj33,
		If (GradeSubj33 = "HD" or GradeSubj33 = "H1", 90,
		If (GradeSubj33 = "D" or GradeSubj33 = "H2A",
		75,
		If (GradeSubj33 = "S", 70,
		If (GradeSubj33 = "C" or GradeSubj33 = "H2B", 65,
		If (GradeSubj33 = "P" or GradeSubj33 = "H3", 55,
		If "GradeSubj33 = "N1", 45,
		If (GradeSubj33 = "N" or GradeSubj33 = "U", 25,
		If (GradeSubj33 = "N2", 20,
		""))))))))

ScoreSubj34	Calculation (Text)	= If (MarkSubj34 ≠ "", MarkSubj34,
		If (GradeSubj34 = "HD" or GradeSubj34 = "H1", 90,
		If (GradeSubj34 = "D" or GradeSubj34 = "H2A",
		75,
		If (GradeSubj34 = "S", 70,
		If (GradeSubj34 = "C" or GradeSubj34 = "H2B", 65,
		If (GradeSubj34 = "P" or GradeSubj34 = "H3", 55,
		If "GradeSubj34 = "N1", 45,
		If (GradeSubj34 = "N" or GradeSubj34 = "U", 25,
		If (GradeSubj34 = "N2", 20,
		""))))))))

ScoreSubj35	Calculation (Text)	= If (MarkSubj35 ≠ "", MarkSubj35,
		If (GradeSubj35 = "HD" or GradeSubj35 = "H1", 90,
		If (GradeSubj35 = "D" or GradeSubj35 = "H2A",
		75,
		If (GradeSubj35 = "S", 70,
		If (GradeSubj35 = "C" or GradeSubj35 = "H2B", 65,
		If (GradeSubj35 = "P" or GradeSubj35 = "H3", 55,
		If "GradeSubj35 = "N1", 45,
		If (GradeSubj35 = "N" or GradeSubj35 = "U", 25,
		If (GradeSubj35 = "N2", 20,
		""))))))))

ScoreSubj36	Calculation (Text)	= If (MarkSubj36 ≠ "", MarkSubj36,
		If (GradeSubj36 = "HD" or GradeSubj36 = "H1", 90,
		If (GradeSubj36 = "D" or GradeSubj36 = "H2A", 75,
		If (GradeSubj36 = "S", 70,
		If (GradeSubj36 = "C" or GradeSubj36 = "H2B", 65,
		If (GradeSubj36 = "P" or GradeSubj36 = "H3", 55,
		If "GradeSubj36 = "N1", 45,
		If (GradeSubj36 = "N" or GradeSubj36 = "U", 25,
		If (GradeSubj36 = "N2", 20,
		""))))))))

Load%Subj15	Calculation (Text)	= If (GradeSubj15 = "HD" or GradeSubj15 = "H1" or GradeSubj15 = "D" or GradeSubj15 = "H2A" or GradeSubj15 = "C" or GradeSubj15 = "H2B" or GradeSubj15 = "P" or GradeSubj15 = "H3" or GradeSubj15 = "S" or GradeSubj15 = "N1" or GradeSubj15 = "N" or GradeSubj15 = "U" or GradeSubj15 = "N2", Round(HrsSubj15 / Completed Hours * 100,3) & "%", "")
Load%Subj16	Calculation (Text)	= If (GradeSubj16 = "HD" or GradeSubj16 = "H1" or GradeSubj16 = "D" or GradeSubj16 = "H2A" or GradeSubj16 = "C" or GradeSubj16 = "H2B" or GradeSubj16 = "P" or GradeSubj16 = "H3" or GradeSubj16 = "S" or GradeSubj16 = "N1" or GradeSubj16 = "N" or GradeSubj16 = "U" or GradeSubj16 = "N2", Round(HrsSubj16 / Completed Hours * 100,3) & "%", "")
Load%Subj17	Calculation (Text)	= If (GradeSubj17 = "HD" or GradeSubj17 = "H1" or GradeSubj17 = "D" or GradeSubj17 = "H2A" or GradeSubj17 = "C" or GradeSubj17 = "H2B" or GradeSubj17 = "P" or GradeSubj17 = "H3" or GradeSubj17 = "S" or GradeSubj17 = "N1" or GradeSubj17 = "N" or GradeSubj17 = "U" or GradeSubj17 = "N2", Round(HrsSubj17 / Completed Hours * 100,3) & "%", "")
Load%Subj18	Calculation (Text)	= If (GradeSubj18 = "HD" or GradeSubj18 = "H1" or GradeSubj18 = "D" or GradeSubj18 = "H2A" or GradeSubj18 = "C" or GradeSubj18 = "H2B" or GradeSubj18 = "P" or GradeSubj18 = "H3" or GradeSubj18 = "S" or GradeSubj18 = "N1" or GradeSubj18 = "N" or GradeSubj18 = "U" or GradeSubj18 = "N2", Round(HrsSubj18 / Completed Hours * 100,3) & "%", "")
Load%Subj19	Calculation (Text)	= If (GradeSubj19 = "HD" or GradeSubj19 = "H1" or GradeSubj19 = "D" or GradeSubj19 = "H2A" or GradeSubj19 = "C" or GradeSubj19 = "H2B" or GradeSubj19 = "P" or GradeSubj19 = "H3" or GradeSubj19 = "S" or GradeSubj19 = "N1" or GradeSubj19 = "N" or GradeSubj19 = "U" or GradeSubj19 = "N2", Round(HrsSubj19 / Completed Hours * 100,3) & "%", "")
Load%Subj20	Calculation (Text)	= If (GradeSubj20 = "HD" or GradeSubj20 = "H1" or GradeSubj20 = "D" or GradeSubj20 = "H2A" or GradeSubj20 = "C" or GradeSubj20 = "H2B" or

		GradeSubj20 = "P" or GradeSubj20 = "H3" or GradeSubj20 = "S" or GradeSubj20 = "N1" or GradeSubj20 = "U" or GradeSubj20 = "N2", Round(HrsSubj20 / Completed Hours * 100,3) & "%", "")
Load%Subj21	Calculation (Text)	= If (GradeSubj21 = "HD" or GradeSubj21 = "H1" or GradeSubj21 = "D" or GradeSubj21 = "H2A" or GradeSubj21 = "C" or GradeSubj21 = "H2B" or GradeSubj21 = "P" or GradeSubj21 = "H3" or GradeSubj21 = "S" or GradeSubj21 = "N1" or GradeSubj21 = "N" or GradeSubj21 = "U" or GradeSubj21 = "N2", Round(HrsSubj21 / Completed Hours * 100,3) & "%", "")
Load%Subj22	Calculation (Text)	= If (GradeSubj22 = "HD" or GradeSubj22 = "H1" or GradeSubj22 = "D" or GradeSubj22 = "H2A" or GradeSubj22 = "C" or GradeSubj22 = "H2B" or GradeSubj22 = "P" or GradeSubj22 = "H3" or GradeSubj22 = "S" or GradeSubj22 = "N1" or GradeSubj22 = "N" or GradeSubj22 = "U" or GradeSubj22 = "N2", Round(HrsSubj22 / Completed Hours * 100,3) & "%", "")
Load%Subj23	Calculation (Text)	= If (GradeSubj23 = "HD" or GradeSubj23 = "H1" or GradeSubj23 = "D" or GradeSubj23 = "H2A" or GradeSubj23 = "C" or GradeSubj23 = "H2B" or GradeSubj23 = "P" or GradeSubj23 = "H3" or GradeSubj23 = "S" or GradeSubj23 = "N1" or GradeSubj23 = "N" or GradeSubj23 = "U" or GradeSubj23 = "N2", Round(HrsSubj23 / Completed Hours * 100,3) & "%", "")
Load%Subj24	Calculation (Text)	= If (GradeSubj24 = "HD" or GradeSubj24 = "H1" or GradeSubj24 = "D" or GradeSubj24 = "H2A" or GradeSubj24 = "C" or GradeSubj24 = "H2B" or GradeSubj24 = "P" or GradeSubj24 = "H3" or GradeSubj24 = "S" or GradeSubj24 = "N1" or GradeSubj24 = "N" or GradeSubj24 = "U" or GradeSubj24 = "N2", Round(HrsSubj24 / Completed Hours * 100,3) & "%", "")
Load%Subj25	Calculation (Text)	= If (GradeSubj25 = "HD" or GradeSubj25 = "H1" or GradeSubj25 = "D" or GradeSubj25 = "H2A" or GradeSubj25 = "C" or GradeSubj25 = "H2B" or GradeSubj25 = "P" or GradeSubj25 = "H3" or GradeSubj25 = "S" or GradeSubj25 = "N1" or GradeSubj25 = "N" or GradeSubj25 = "U" or GradeSubj25 = "N2", Round(HrsSubj25 / Completed Hours * 100,3) & "%", "")
Load%Subj26	Calculation (Text)	= If (GradeSubj26 = "HD" or GradeSubj26 = "H1" or GradeSubj26 = "D" or GradeSubj26 = "H2A" or GradeSubj26 = "C" or GradeSubj26 = "H2B" or GradeSubj26 = "P" or GradeSubj26 = "H3" or GradeSubj26 = "S" or GradeSubj26 = "N1" or GradeSubj26 = "N" or GradeSubj26 = "U" or GradeSubj26 = "N2", Round(HrsSubj26 / Completed Hours * 100,3) & "%", "")

Load%Subj27	Calculation (Text)	= If (GradeSubj27 = "HD" or GradeSubj27 = "H1" or GradeSubj27 = "D" or GradeSubj27 = "H2A" or GradeSubj27 = "C" or GradeSubj27 = "H2B" or GradeSubj27 = "P" or GradeSubj27 = "H3" or GradeSubj27 = "S" or GradeSubj27 = "N1" or GradeSubj27 = "N" or GradeSubj27 = "U" or GradeSubj27 = "N2", Round(HrsSubj27 / Completed Hours * 100,3) & "%", "")
Load%Subj28	Calculation (Text)	= If (GradeSubj28 = "HD" or GradeSubj28 = "H1" or GradeSubj28 = "D" or GradeSubj28 = "H2A" or GradeSubj28 = "C" or GradeSubj28 = "H2B" or GradeSubj28 = "P" or GradeSubj28 = "H3" or GradeSubj28 = "S" or GradeSubj28 = "N1" or GradeSubj28 = "N" or GradeSubj28 = "U" or GradeSubj28 = "N2", Round(HrsSubj28 / Completed Hours * 100,3) & "%", "")
Load%Subj29	Calculation (Text)	= If (GradeSubj29 = "HD" or GradeSubj29 = "H1" or GradeSubj29 = "D" or GradeSubj29 = "H2A" or GradeSubj29 = "C" or GradeSubj29 = "H2B" or GradeSubj29 = "P" or GradeSubj29 = "H3" or GradeSubj29 = "S" or GradeSubj29 = "N1" or GradeSubj30 = "N" or GradeSubj30 = "U" or GradeSubj30 = "N2", Round(HrsSubj30 / Completed Hours * 100,3) & "%", "")
Load%Subj30	Calculation (Text)	= If (GradeSubj30 = "HD" or GradeSubj30 = "H1" or GradeSubj30 = "D" or GradeSubj30 = "H2A" or GradeSubj30 = "C" or GradeSubj30 = "H2B" or GradeSubj30 = "P" or GradeSubj30 = "H3" or GradeSubj30 = "S" or GradeSubj30 = "N1" or GradeSubj30 = "N" or GradeSubj30 = "U" or GradeSubj30 = "N2", Round(HrsSubj30 / Completed Hours * 100,3) & "%", "")
Load%Subj31	Calculation (Text)	= If (GradeSubj31 = "HD" or GradeSubj31 = "H1" or GradeSubj31 = "D" or GradeSubj31 = "H2A" or GradeSubj31 = "C" or GradeSubj31 = "H2B" or GradeSubj31 = "P" or GradeSubj31 = "H3" or GradeSubj31 = "S" or GradeSubj31 = "N1" or GradeSubj31 = "N" or GradeSubj31 = "U" or GradeSubj31 = "N2", Round(HrsSubj31 / Completed Hours * 100,3) & "%", "")
Load%Subj32	Calculation (Text)	= If (GradeSubj32 = "HD" or GradeSubj32 = "H1" or GradeSubj32 = "D" or GradeSubj32 = "H2A" or GradeSubj32 = "C" or GradeSubj32 = "H2B" or GradeSubj32 = "P" or GradeSubj32 = "H3" or GradeSubj32 = "S" or GradeSubj32 = "N1" or GradeSubj32 = "N" or GradeSubj32 = "U" or GradeSubj32 = "N2", Round(HrsSubj32 / Completed Hours * 100,3) & "%", "")

Load%Subj33	Calculation (Text)	= If (GradeSubj33 = "HD" or GradeSubj33 = "H1" or GradeSubj33 = "D" or GradeSubj33 = "H2A" or GradeSubj33 = "C" or GradeSubj33 = "H2B" or GradeSubj33 = "P" or GradeSubj33 = "H3" or GradeSubj33 = "S" or GradeSubj33 = "N1" or GradeSubj33 = "N" or GradeSubj33 = "U" or GradeSubj33 = "N2", Round(HrsSubj33 / Completed Hours * 100,3) & "%", "")
Load%Subj34	Calculation (Text)	= If (GradeSubj34 = "HD" or GradeSubj34 = "H1" or GradeSubj34 = "D" or GradeSubj34 = "H2A" or GradeSubj34 = "C" or GradeSubj34 = "H2B" or GradeSubj34 = "P" or GradeSubj34 = "H3" or GradeSubj34 = "S" or GradeSubj34 = "N1" or GradeSubj34 = "N" or GradeSubj34 = "U" or GradeSubj34 = "N2", Round(HrsSubj34 / Completed Hours * 100,3) & "%", "")
Load%Subj35	Calculation (Text)	= If (GradeSubj35 = "HD" or GradeSubj35 = "H1" or GradeSubj35 = "D" or GradeSubj35 = "H2A" or GradeSubj35 = "C" or GradeSubj35 = "H2B" or GradeSubj35 = "P" or GradeSubj35 = "H3" or GradeSubj35 = "S" or GradeSubj35 = "N1" or GradeSubj35 = "N" or GradeSubj35 = "U" or GradeSubj35 = "N2", Round(HrsSubj35 / Completed Hours * 100,3) & "%", "")
Load%Subj36	Calculation (Text)	= If (GradeSubj36 = "HD" or GradeSubj36 = "H1" or GradeSubj36 = "D" or GradeSubj36 = "H2A" or GradeSubj36 = "C" or GradeSubj36 = "H2B" or GradeSubj36 = "P" or GradeSubj36 = "H3" or GradeSubj36 = "S" or GradeSubj36 = "N1" or GradeSubj36 = "N" or GradeSubj36 = "U" or GradeSubj36 = "N2", Round(HrsSubj36 / Completed Hours * 100,3) & "%", "")
AdjScoreSubj15	Calculation (Text)	= If (Load%Subj15 = "", "", Round(ScoreSubj15 * Load%Subj15 / 100, 2))
AdjScoreSubj16	Calculation (Text)	= If (Load%Subj16 = "", "", Round(ScoreSubj16 * Load%Subj16 / 100, 2))
AdjScoreSubj17	Calculation (Text)	= If (Load%Subj17 = "", "", Round(ScoreSubj17 * Load%Subj17 / 100, 2))
AdjScoreSubj18	Calculation (Text)	= If (Load%Subj18 = "", "", Round(ScoreSubj18 * Load%Subj18 / 100, 2))
AdjScoreSubj19	Calculation (Text)	= If (Load%Subj19 = "", "", Round(ScoreSubj19 * Load%Subj19 / 100, 2))
AdjScoreSubj20	Calculation (Text)	= If (Load%Subj20 = "", "", Round(ScoreSubj20 * Load%Subj20 / 100, 2))
AdjScoreSubj21	Calculation (Text)	= If (Load%Subj21 = "", "", Round(ScoreSubj21 * Load%Subj21 / 100, 2))
AdjScoreSubj22	Calculation (Text)	= If (Load%Subj22 = "", "", Round(ScoreSubj22 * Load%Subj22 / 100, 2))
AdjScoreSubj23	Calculation (Text)	= If (Load%Subj23 = "", "", Round(ScoreSubj23 * Load%Subj23 / 100, 2))

AdjScoreSubj24	Calculation (Text)	= If (Load%Subj24 = "", "", Round(ScoreSubj24 * Load%Subj24 / 100, 2))
AdjScoreSubj25	Calculation (Text)	= If (Load%Subj25 = "", "", Round(ScoreSubj25 * Load%Subj25 / 100, 2))
AdjScoreSubj26	Calculation (Text)	= If (Load%Subj26 = "", "", Round(ScoreSubj26 * Load%Subj26 / 100, 2))
AdjScoreSubj27	Calculation (Text)	= If (Load%Subj27 = "", "", Round(ScoreSubj27 * Load%Subj27 / 100, 2))
AdjScoreSubj28	Calculation (Text)	= If (Load%Subj28 = "", "", Round(ScoreSubj28 * Load%Subj28 / 100, 2))
AdjScoreSubj29	Calculation (Text)	= If (Load%Subj29 = "", "", Round(ScoreSubj29 * Load%Subj29 / 100, 2))
AdjScoreSubj30	Calculation (Text)	= If (Load%Subj30 = "", "", Round(ScoreSubj30 * Load%Subj30 / 100, 2))
AdjScoreSubj31	Calculation (Text)	= If (Load%Subj31 = "", "", Round(ScoreSubj31 * Load%Subj31 / 100, 2))
AdjScoreSubj32	Calculation (Text)	= If (Load%Subj32 = "", "", Round(ScoreSubj32 * Load%Subj32 / 100, 2))
AdjScoreSubj33	Calculation (Text)	= If (Load%Subj33 = "", "", Round(ScoreSubj33 * Load%Subj33 / 100, 2))
AdjScoreSubj34	Calculation (Text)	= If (Load%Subj34 = "", "", Round(ScoreSubj34 * Load%Subj34 / 100, 2))
AdjScoreSubj35	Calculation (Text)	= If (Load%Subj35 = "", "", Round(ScoreSubj35 * Load%Subj35 / 100, 2))
AdjScoreSubj36	Calculation (Text)	= If (Load%Subj36 = "", "", Round(ScoreSubj36 * Load%Subj36 / 100, 2))
Member of Target Group:	Text	Lookup: "Ref. No." in "RchDat94.FM" when "Match Field" matches "Match Field: If no match, copy: "NO"
Responded?	Number	Lookup: "Questionnaire Response" in "RchDat94.FM" when "Match Field" matches "Match Field" If no match, copy: "NtFnd"
Grade Aims	Text	Lookup: "Q5" in "RchDat94. FM" when "Match Field" matches "Match Field" If no match, copy: "?"
Rate	Text	Lookup: "Q6 in "RchDat94.FM" when "Match Field" matches "Match Field" If no match, copy: "?"
No. of Semesters Elapsed	Number	Auto-enter: "2" Required value Only allow values of type: "Number" Only allow values in the range from "1" to "16"
Campus	Text	Lookup: "Campus" in "MGDATA94.FM" when "Match Field" matches "Match Field" If no match, copy: "ZZ"

Level	Text	Lookup: "Level" in "MGDATA94.FM" when "Match Field" matches "Match Field" If no match, copy: "ZZ"
Course Hours	Text	Lookup: "HrsLevels123456" in "Cse1994.FM" when "CourseID" matches "CseCode" If no match, copy: "ZZ"

Year_Course_ Hours	Calculation (Text)	= If (Level = "1", Middle (Course Hours, 1, 3),
		If (Level = "2", Middle (Course Hours, 5, 3),
		If (Level = "3", Middle (Course Hours,9, 3),
		If (Level = "4", Middle (Course Hours, 13, 3),
		If (Level = "5", Middle (Course Hours, 17, 3),
		If (Level = "6" or Level = "7" or Level = "8" or Level = "9", Middle (Course Hours, 21, 3),
		((Middle (Course Hours, 1, 3) + Middle (Course Hours, 5, 3) + Middle (Course Hours, 9, 3) + Middle (Course Hours, 13, 3) + Middle (Course Hours, 17, 3) + Middle (Course Hours, 21, 3))
		/ (If (Middle (Course Hours, 1, 3) = "000", 0,1) +
		(If (Middle (Course Hours, 5, 3) = "000", 0,1) +
		(If (Middle (Course Hours, 9, 3) = "000", 0,1) +
		(If (Middle (Course Hours, 13, 3) = "000", 0,1) +
		(If (Middle (Course Hours, 17, 3) = "000", 0,1) +
		(If (Middle (Course Hours, 21, 3) = "000", 0,1))))))))

Completed Hours	Calculation (Number)	If (GradeSubj01 = "HD" or GradeSubj01 = "H1" or GradeSubj01 = "D" or GradeSubj01 = "H2A" or GradeSubj01 = "C" or GradeSubj01 = "H2B" or GradeSubj01 = "P" or GradeSubj01 = "H3" or GradeSubj01 = "S" or GradeSubj01 = "N1" or GradeSubj01 = "N" or GradeSubj01 = "U" or GradeSubj01 = "N2", HrsSubj01, 0) + If (GradeSubj02 = "HD" or GradeSubj02 = "H1" or GradeSubj02 = "D" or GradeSubj02 = "H2A" or GradeSubj02 = "C" or GradeSubj02 = "H2B" or GradeSubj02 = "P" or GradeSubj02 = "H3" or GradeSubj02 = "S" or GradeSubj02 = "N1" or GradeSubj02 = "N" or GradeSubj02 = "U" or GradeSubj02 = "N2", HrsSubj02, 0) + If (GradeSubj03 = "HD" or GradeSubj03 = "H1" or GradeSubj03 = "D" or GradeSubj03 = "H2A" or GradeSubj03 = "C" or GradeSubj03 = "H2B" or GradeSubj03 = "P" or GradeSubj03 = "H3" or GradeSubj03 = "S" or GradeSubj03 = "N1" or GradeSubj03 = "N" or GradeSubj03 = "U" or GradeSubj03 = "N2", HrsSubj03, 0) + If (GradeSubj04 = "HD" or GradeSubj04 = "H1" or GradeSubj04 = "D" or GradeSubj04 = "H2A" or GradeSubj04 = "C" or GradeSubj04 = "H2B" or GradeSubj04 = "P" or GradeSubj04 = "H3" or GradeSubj04 = "S" or GradeSubj04 = "N1" or GradeSubj04 = "N" or GradeSubj04 = "U" or GradeSubj04 = "N2", HrsSubj04, 0) + If (GradeSubj05 = "HD" or GradeSubj05 = "H1" or GradeSubj05 = "D" or GradeSubj05 = "H2A" or GradeSubj05 = "C" or GradeSubj05 = "H2B" or GradeSubj05 = "P" or GradeSubj05 = "H3" or

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GradeSubj05 = "S" or GradeSubj05 = "N1" or
GradeSubj05 = "N" or GradeSubj05 = "U" or
GradeSubj05 = "N2", HrsSubj05, 0)
 + If (GradeSubj06 = "HD" or GradeSubj06 = "H1"
or GradeSubj06 = "D" or GradeSubj06 = "H2A" or
GradeSubj06 = "C" or GradeSubj06 = "H2B" or
GradeSubj06 = "P" or GradeSubj06 = "H3" or
GradeSubj06 = "S" or GradeSubj06 = "N1" or
GradeSubj06 = "N" or GradeSubj06 = "U" or
GradeSubj06 = "N2", HrsSubj06, 0)
 + If (GradeSubj07 = "HD" or GradeSubj07 = "H1"
or GradeSubj07 = "D" or GradeSubj07 = "H2A" or
GradeSubj07 = "C" or GradeSubj07 = "H2B" or
GradeSubj07 = "P" or GradeSubj07 = "H3" or
GradeSubj07 = "S" or GradeSubj07 = "N1" or
GradeSubj07 = "N" or GradeSubj07 = "U" or
GradeSubj07 = "N2", HrsSubj07, 0)
 + If (GradeSubj08 = "HD" or GradeSubj08 = "H1"
or GradeSubj08 = "D" or GradeSubj08 = "H2A" or
GradeSubj08 = "C" or GradeSubj08 = "H2B" or
GradeSubj08 = "P" or GradeSubj08 = "H3" or
GradeSubj08 = "S" or GradeSubj08 = "N1" or
GradeSubj08 = "N" or GradeSubj08 = "U" or
GradeSubj08 = "N2", HrsSubj08, 0)
 + If (GradeSubj09 = "HD" or GradeSubj09 = "H1"
or GradeSubj09 = "D" or GradeSubj09 = "H2A" or
GradeSubj09 = "C" or GradeSubj09 = "H2B" or
GradeSubj09 = "P" or GradeSubj09 = "H3" or
GradeSubj09 = "S" or GradeSubj09 = "N1" or
GradeSubj09 = "N" or GradeSubj09 = "U" or
GradeSubj09 = "N2", HrsSubj09, 0)
 + If (GradeSubj10 = "HD" or GradeSubj10 = "H1"
or GradeSubj10 = "D" or GradeSubj10 = "H2A" or
GradeSubj10 = "C" or GradeSubj10 = "H2B" or
GradeSubj10 = "P" or GradeSubj10 = "H3" or
GradeSubj10 = "S" or GradeSubj10 = "N1" or
GradeSubj10 = "N" or GradeSubj10 = "U" or
GradeSubj10 = "N2", HrsSubj10, 0)
 + If (GradeSubj11 = "HD" or GradeSubj11 = "H1"
or GradeSubj11 = "D" or GradeSubj11 = "H2A" or
GradeSubj11 = "C" or GradeSubj11 = "H2B" or
GradeSubj11 = "P" or GradeSubj11 = "H3" or
GradeSubj11 = "S" or GradeSubj11 = "N1" or
GradeSubj11 = "N" or GradeSubj11 = "U" or
GradeSubj11 = "N2", HrsSubj11, 0)
 + If (GradeSubj12 = "HD" or GradeSubj12 = "H1"
or GradeSubj12 = "D" or GradeSubj12 = "H2A" or
GradeSubj12 = "C" or GradeSubj12 = "H2B" or
GradeSubj12 = "P" or GradeSubj12 = "H3" or
GradeSubj12 = "S" or GradeSubj12 = "N1" or
GradeSubj12 = "N" or GradeSubj12 = "U" or
GradeSubj12 = "N2", HrsSubj12, 0)
 + If (GradeSubj13 = "HD" or GradeSubj13 = "H1"
or GradeSubj13 = "D" or GradeSubj13 = "H2A" or
GradeSubj13 = "C" or GradeSubj13 = "H2B" or
GradeSubj13 = "P" or GradeSubj13 = "H3" or
GradeSubj13 = "S" or GradeSubj13 = "N1" or
GradeSubj13 = "N" or GradeSubj13 = "U" or
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GradeSubj13 = "N2", HrsSubj13, 0)
 + If (GradeSubj14 = "HD" or GradeSubj14 = "H1"
or GradeSubj14 = "D" or GradeSubj14 = "H2A" or
GradeSubj14 = "C" or GradeSubj14 = "H2B" or
GradeSubj14 = "P" or GradeSubj14 = "H3" or
GradeSubj14 = "S" or GradeSubj14 = "N1" or
GradeSubj14 = "N" or GradeSubj14 = "U" or
GradeSubj14 = "N2", HrsSubj14, 0)
 + If (GradeSubj15 = "HD" or GradeSubj15 = "H1"
or GradeSubj15 = "D" or GradeSubj15 = "H2A" or
GradeSubj15 = "C" or GradeSubj15 = "H2B" or
GradeSubj15 = "P" or GradeSubj15 = "H3" or
GradeSubj15 = "S" or GradeSubj15 = "N1" or
GradeSubj15 = "N" or GradeSubj15 = "U" or
GradeSubj15 = "N2", HrsSubj15, 0)
 + If (GradeSubj16 = "HD" or GradeSubj16 = "H1"
or GradeSubj16 = "D" or GradeSubj16 = "H2A" or
GradeSubj16 = "C" or GradeSubj16 = "H2B" or
GradeSubj16 = "P" or GradeSubj16 = "H3" or
GradeSubj16 = "S" or GradeSubj16 = "N1" or
GradeSubj16 = "N" or GradeSubj16 = "U" or
GradeSubj16 = "N2", HrsSubj16, 0)
 + If (GradeSubj17 = "HD" or GradeSubj17 = "H1"
or GradeSubj17 = "D" or GradeSubj17 = "H2A" or
GradeSubj17 = "C" or GradeSubj17 = "H2B" or
GradeSubj17 = "P" or GradeSubj17 = "H3" or
GradeSubj17 = "S" or GradeSubj17 = "N1" or
GradeSubj17 = "N" or GradeSubj17 = "U" or
GradeSubj17 = "N2", HrsSubj17, 0)
 + If (GradeSubj18 = "HD" or GradeSubj18 = "H1"
or GradeSubj18 = "D" or GradeSubj18 = "H2A" or
GradeSubj18 = "C" or GradeSubj18 = "H2B" or
GradeSubj18 = "P" or GradeSubj18 = "H3" or
GradeSubj18 = "S" or GradeSubj18 = "N1" or
GradeSubj18 = "N" or GradeSubj18 = "U" or
GradeSubj18 = "N2", HrsSubj18, 0)
 + If (GradeSubj19 = "HD" or GradeSubj19 = "H1"
or GradeSubj19 = "D" or GradeSubj19 = "H2A" or
GradeSubj19 = "C" or GradeSubj19 = "H2B" or
GradeSubj19 = "P" or GradeSubj19 = "H3" or
GradeSubj19 = "S" or GradeSubj19 = "N1" or
GradeSubj19 = "N" or GradeSubj19 = "U" or
GradeSubj19 = "N2", HrsSubj19, 0)
 + If (GradeSubj20 = "HD" or GradeSubj20 = "H1"
or GradeSubj20 = "D" or GradeSubj20 = "H2A" or
GradeSubj20 = "C" or GradeSubj20 = "H2B" or
GradeSubj20 = "P" or GradeSubj20 = "H3" or
GradeSubj20 = "S" or GradeSubj20 = "N1" or
GradeSubj20 = "N" or GradeSubj20 = "U" or
GradeSubj20 = "N2", HrsSubj20, 0)
 + If (GradeSubj21 = "HD" or GradeSubj21 = "H1"
or GradeSubj21 = "D" or GradeSubj21 = "H2A" or
GradeSubj21 = "C" or GradeSubj21 = "H2B" or
GradeSubj21 = "P" or GradeSubj21 = "H3" or
GradeSubj21 = "S" or GradeSubj21 = "N1" or
GradeSubj21 = "N" or GradeSubj21 = "U" or
GradeSubj21 = "N2", HrsSubj21, 0)
 + If (GradeSubj22 = "HD" or GradeSubj22 = "H1"
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or GradeSubj22 = "D" or GradeSubj22 = "H2A" or
GradeSubj22 = "C" or GradeSubj22 = "H2B" or
GradeSubj22 = "P" or GradeSubj22 = "H3" or
GradeSubj22 = "S" or GradeSubj22 = "N1" or
GradeSubj22 = "N" or GradeSubj22 = "U" or
GradeSubj22 = "N2", HrsSubj22, 0)
 + If (GradeSubj23 = "HD" or GradeSubj23 = "H1"
or GradeSubj23 = "D" or GradeSubj23 = "H2A" or
GradeSubj23 = "C" or GradeSubj23 = "H2B" or
GradeSubj23 = "P" or GradeSubj23 = "H3" or
GradeSubj23 = "S" or GradeSubj23 = "N1" or
GradeSubj23 = "N" or GradeSubj23 = "U" or
GradeSubj23 = "N2", HrsSubj23, 0)
 + If (GradeSubj24 = "HD" or GradeSubj24 = "H1"
or GradeSubj24 = "D" or GradeSubj24 = "H2A" or
GradeSubj24 = "C" or GradeSubj24 = "H2B" or
GradeSubj24 = "P" or GradeSubj24 = "H3" or
GradeSubj24 = "S" or GradeSubj24 = "N1" or
GradeSubj24 = "N" or GradeSubj24 = "U" or
GradeSubj24 = "N2", HrsSubj24, 0)
 + If (GradeSubj25 = "HD" or GradeSubj25 = "H1"
or GradeSubj25 = "D" or GradeSubj25 = "H2A" or
GradeSubj25 = "C" or GradeSubj25 = "H2B" or
GradeSubj25 = "P" or GradeSubj25 = "H3" or
GradeSubj25 = "S" or GradeSubj25 = "N1" or
GradeSubj25 = "N" or GradeSubj25 = "U" or
GradeSubj25 = "N2", HrsSubj25, 0)
 + If (GradeSubj26 = "HD" or GradeSubj26 = "H1"
or GradeSubj26 = "D" or GradeSubj26 = "H2A" or
GradeSubj26 = "C" or GradeSubj26 = "H2B" or
GradeSubj26 = "P" or GradeSubj26 = "H3" or
GradeSubj26 = "S" or GradeSubj26 = "N1" or
GradeSubj26 = "N" or GradeSubj26 = "U" or
GradeSubj26 = "N2", HrsSubj26, 0)
 + If (GradeSubj27 = "HD" or GradeSubj27 = "H1"
or GradeSubj27 = "D" or GradeSubj27 = "H2A" or
GradeSubj27 = "C" or GradeSubj27 = "H2B" or
GradeSubj27 = "P" or GradeSubj27 = "H3" or
GradeSubj27 = "S" or GradeSubj27 = "N1" or
GradeSubj27 = "N" or GradeSubj27 = "U" or
GradeSubj27 = "N2", HrsSubj27, 0)
 + If (GradeSubj28 = "HD" or GradeSubj28 = "H1"
or GradeSubj28 = "D" or GradeSubj28 = "H2A" or
GradeSubj28 = "C" or GradeSubj28 = "H2B" or
GradeSubj28 = "P" or GradeSubj28 = "H3" or
GradeSubj28 = "S" or GradeSubj28 = "N1" or
GradeSubj28 = "N" or GradeSubj28 = "U" or
GradeSubj28 = "N2", HrsSubj28, 0)
 + If (GradeSubj29 = "HD" or GradeSubj29 = "H1"
or GradeSubj29 = "D" or GradeSubj29 = "H2A" or
GradeSubj29 = "C" or GradeSubj29 = "H2B" or
GradeSubj29 = "P" or GradeSubj29 = "H3" or
GradeSubj29 = "S" or GradeSubj29 = "N1" or
GradeSubj29 = "N" or GradeSubj29 = "U" or
GradeSubj29 = "N2", HrsSubj29, 0)
 + If (GradeSubj30 = "HD" or GradeSubj30 = "H1"
or GradeSubj30 = "D" or GradeSubj30 = "H2A" or
GradeSubj30 = "C" or GradeSubj30 = "H2B" or
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		GradeSubj30 = "P" or GradeSubj30 = "H3" or GradeSubj30 = "S" or GradeSubj30 = "N1" or GradeSubj30 = "N" or GradeSubj30 = "U" or GradeSubj30 = "N2", HrsSubj30, 0) + If (GradeSubj31 = "HD" or GradeSubj31 = "H1" or GradeSubj31 = "D" or GradeSubj31 = "H2A" or GradeSubj31 = "C" or GradeSubj31 = "H2B" or GradeSubj31 = "P" or GradeSubj31 = "H3" or GradeSubj31 = "S" or GradeSubj31 = "N1" or GradeSubj31 = "N" or GradeSubj31 = "U" or GradeSubj31 = "N2", HrsSubj31, 0) + If (GradeSubj32 = "HD" or GradeSubj32 = "H1" or GradeSubj32 = "D" or GradeSubj32 = "H2A" or GradeSubj32 = "C" or GradeSubj32 = "H2B" or GradeSubj32 = "P" or GradeSubj32 = "H3" or GradeSubj32 = "S" or GradeSubj32 = "N1" or GradeSubj32 = "N" or GradeSubj32 = "U" or GradeSubj32 = "N2", HrsSubj32, 0) + If (GradeSubj33 = "HD" or GradeSubj33 = "H1" or GradeSubj33 = "D" or GradeSubj33 = "H2A" or GradeSubj33 = "C" or GradeSubj33 = "H2B" or GradeSubj33 = "P" or GradeSubj33 = "H3" or GradeSubj33 = "S" or GradeSubj33 = "N1" or GradeSubj33 = "N" or GradeSubj33 = "U" or GradeSubj33 = "N2", HrsSubj33, 0) + If (GradeSubj34 = "HD" or GradeSubj34 = "H1" or GradeSubj34 = "D" or GradeSubj34 = "H2A" or GradeSubj34 = "C" or GradeSubj34 = "H2B" or GradeSubj34 = "P" or GradeSubj34 = "H3" or GradeSubj34 = "S" or GradeSubj34 = "N1" or GradeSubj34 = "N" or GradeSubj34 = "U" or GradeSubj34 = "N2", HrsSubj34, 0) + If (GradeSubj35 = "HD" or GradeSubj35 = "H1" or GradeSubj35 = "D" or GradeSubj35 = "H2A" or GradeSubj35 = "C" or GradeSubj35 = "H2B" or GradeSubj35 = "P" or GradeSubj35 = "H3" or GradeSubj35 = "S" or GradeSubj35 = "N1" or GradeSubj35 = "N" or GradeSubj35 = "U" or GradeSubj35 = "N2", HrsSubj35, 0) + If (GradeSubj36 = "HD" or GradeSubj36 = "H1" or GradeSubj36 = "D" or GradeSubj36 = "H2A" or GradeSubj36 = "C" or GradeSubj36 = "H2B" or GradeSubj36 = "P" or GradeSubj36 = "H3" or GradeSubj36 = "S" or GradeSubj36 = "N1" or GradeSubj36 = "N" or GradeSubj36 = "U" or GradeSubj36 = "N2", HrsSubj36, 0)
Completed Load	Calculation (Number)	= Completed Hours / Year_Course_Hours
Aggregate AdjScore	Calculation (Number)	= AdjScoreSubj01 + AdjScoreSubj02 + AdjScoreSubj03 + AdjScoreSubj01 + AdjScoreSubj02 + AdjScoreSubj03 + AdjScoreSubj04 + AdjScoreSubj05 + AdjScoreSubj06 + AdjScoreSubj07 + AdjScoreSubj08 + AdjScoreSubj09 + AdjScoreSubj10 + AdjScoreSubj11 + AdjScoreSubj12 + AdjScoreSubj13 + AdjScoreSubj14 + AdjScoreSubj15 +

		AdjScoreSubj16 + AdjScoreSubj17 + AdjScoreSubj18 + AdjScoreSubj19 + AdjScoreSubj20 + AdjScoreSubj21 + AdjScoreSubj22 + AdjScoreSubj23 + AdjScoreSubj24 + AdjScoreSubj25 + AdjScoreSubj26 + AdjScoreSubj27 + AdjScoreSubj28 + AdjScoreSubj29 + AdjScoreSubj30 + AdjScoreSubj31 + AdjScoreSubj32 + AdjScoreSubj33 + AdjScoreSubj34 + AdjScoreSubj35 + AdjScoreSubj36
Weighted Success Index	Calculation (Number)	= Round (If (Grade Aims = "3", Aggregate AdjScore * 1.25, If (Grade Aims = "2", Aggregate AdjScore * 1.11, Aggregate AdjScore)) * If ((Rate = 2 and Passed Load < (0.3375 * No. of Semesters Elapsed)), (Passed Load / (0.3375 * No. of Semesters Elapsed)), If((Rate ≥3 and Passed Load < (0.45 * No. of Semesters Elapsed)), (Passed Load / (0.45 * No. of Semesters Elapsed)), 1)) ,1)
Passed Hours	Calculation (Number)	If (GradeSubj01 = "HD" or GradeSubj01 = "H1" or GradeSubj01 = "D" or GradeSubj01 = "H2A" or GradeSubj01 = "C" or GradeSubj01 = "H2B" or GradeSubj01 = "P" or GradeSubj01 = "H3" or GradeSubj01 = "S", HrsSubj01, 0) + If (GradeSubj02 = "HD" or GradeSubj02 = "H1" or GradeSubj02 = "D" or GradeSubj02 = "H2A" or GradeSubj02 = "C" or GradeSubj02 = "H2B" or GradeSubj02 = "P" or GradeSubj02 = "H3" or GradeSubj02 = "S", HrsSubj02, 0) + If (GradeSubj03 = "HD" or GradeSubj03 = "H1" or GradeSubj03 = "D" or GradeSubj03 = "H2A" or GradeSubj03 = "C" or GradeSubj03 = "H2B" or GradeSubj03 = "P" or GradeSubj03 = "H3" or GradeSubj03 = "S", HrsSubj03, 0) + If (GradeSubj04 = "HD" or GradeSubj04 = "H1" or GradeSubj04 = "D" or GradeSubj04 = "H2A" or GradeSubj04 = "C" or GradeSubj04 = "H2B" or GradeSubj04 = "P" or GradeSubj04 = "H3" or GradeSubj04 = "S", HrsSubj04, 0) + If (GradeSubj05 = "HD" or GradeSubj05 = "H1" or GradeSubj05 = "D" or GradeSubj05 = "H2A" or GradeSubj05 = "C" or GradeSubj05 = "H2B" or GradeSubj05 = "P" or GradeSubj05 = "H3" or GradeSubj05 = "S", HrsSubj05, 0) + If (GradeSubj06 = "HD" or GradeSubj06 = "H1" or GradeSubj06 = "D" or GradeSubj06 = "H2A" or GradeSubj06 = "C" or GradeSubj06 = "H2B" or GradeSubj06 = "P" or GradeSubj06 = "H3" or GradeSubj06 = "S", HrsSubj06, 0) + If (GradeSubj07 = "HD" or GradeSubj07 = "H1" or GradeSubj07 = "D" or GradeSubj07 = "H2A" or GradeSubj07 = "C" or GradeSubj07 = "H2B" or GradeSubj07 = "P" or GradeSubj07 = "H3" or

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GradeSubj07 = "S", HrsSubj07, 0)
 + If (GradeSubj08 = "HD" or GradeSubj08 = "H1"
or GradeSubj08 = "D" or GradeSubj08 = "H2A" or
GradeSubj08 = "C" or GradeSubj08 = "H2B" or
GradeSubj08 = "P" or GradeSubj08 = "H3" or
GradeSubj08 = "S", HrsSubj08, 0)
 + If (GradeSubj09 = "HD" or GradeSubj09 = "H1"
or GradeSubj09 = "D" or GradeSubj09 = "H2A" or
GradeSubj09 = "C" or GradeSubj09 = "H2B" or
GradeSubj09 = "P" or GradeSubj09 = "H3" or
GradeSubj09 = "S", HrsSubj09, 0)
 + If (GradeSubj10 = "HD" or GradeSubj10 = "H1"
or GradeSubj10 = "D" or GradeSubj10 = "H2A" or
GradeSubj10 = "C" or GradeSubj10 = "H2B" or
GradeSubj10 = "P" or GradeSubj10 = "H3" or
GradeSubj10 = "S", HrsSubj10, 0)
 + If (GradeSubj11 = "HD" or GradeSubj11 = "H1"
or GradeSubj11 = "D" or GradeSubj11 = "H2A" or
GradeSubj11 = "C" or GradeSubj11 = "H2B" or
GradeSubj11 = "P" or GradeSubj11 = "H3" or
GradeSubj11 = "S", HrsSubj11, 0)
 + If (GradeSubj12 = "HD" or GradeSubj12 = "H1"
or GradeSubj12 = "D" or GradeSubj12 = "H2A" or
GradeSubj12 = "C" or GradeSubj12 = "H2B" or
GradeSubj12 = "P" or GradeSubj12 = "H3" or
GradeSubj12 = "S", HrsSubj12, 0)
 + If (GradeSubj13 = "HD" or GradeSubj13 = "H1"
or GradeSubj13 = "D" or GradeSubj13 = "H2A" or
GradeSubj13 = "C" or GradeSubj13 = "H2B" or
GradeSubj13 = "P" or GradeSubj13 = "H3" or
GradeSubj13 = "S", HrsSubj13, 0)
 + If (GradeSubj14 = "HD" or GradeSubj14 = "H1"
or GradeSubj14 = "D" or GradeSubj14 = "H2A" or
GradeSubj14 = "C" or GradeSubj14 = "H2B" or
GradeSubj14 = "P" or GradeSubj14 = "H3" or
GradeSubj14 = "S", HrsSubj14, 0)
 + If (GradeSubj15 = "HD" or GradeSubj15 = "H1"
or GradeSubj15 = "D" or GradeSubj15 = "H2A" or
GradeSubj15 = "C" or GradeSubj15 = "H2B" or
GradeSubj15 = "P" or GradeSubj15 = "H3" or
GradeSubj15 = "S", HrsSubj15, 0)
 + If (GradeSubj16 = "HD" or GradeSubj16 = "H1"
or GradeSubj16 = "D" or GradeSubj16 = "H2A" or
GradeSubj16 = "C" or GradeSubj16 = "H2B" or
GradeSubj16 = "P" or GradeSubj16 = "H3" or
GradeSubj16 = "S", HrsSubj16, 0)
 + If (GradeSubj17 = "HD" or GradeSubj17 = "H1"
or GradeSubj17 = "D" or GradeSubj17 = "H2A" or
GradeSubj17 = "C" or GradeSubj17 = "H2B" or
GradeSubj17 = "P" or GradeSubj17 = "H3" or
GradeSubj17 = "S", HrsSubj17, 0)
 + If (GradeSubj18 = "HD" or GradeSubj18 = "H1"
or GradeSubj18 = "D" or GradeSubj18 = "H2A" or
GradeSubj18 = "C" or GradeSubj18 = "H2B" or
GradeSubj18 = "P" or GradeSubj18 = "H3" or
GradeSubj18 = "S", HrsSubj18, 0)
 + If (GradeSubj19 = "HD" or GradeSubj19 = "H1"
or GradeSubj19 = "D" or GradeSubj19 = "H2A" or
```

```
GradeSubj19 = "C" or GradeSubj19 = "H2B" or
GradeSubj19 = "P" or GradeSubj19 = "H3" or
GradeSubj19 = "S", HrsSubj19, 0)
 + If (GradeSubj20 = "HD" or GradeSubj20 = "H1"
or GradeSubj20 = "D" or GradeSubj20 = "H2A" or
GradeSubj20 = "C" or GradeSubj20 = "H2B" or
GradeSubj20 = "P" or GradeSubj20 = "H3" or
GradeSubj20 = "S", HrsSubj20, 0)
 + If (GradeSubj21 = "HD" or GradeSubj21 = "H1"
or GradeSubj21 = "D" or GradeSubj21 = "H2A" or
GradeSubj21 = "C" or GradeSubj21 = "H2B" or
GradeSubj21 = "P" or GradeSubj21 = "H3" or
GradeSubj21 = "S", HrsSubj21, 0)
 + If (GradeSubj22 = "HD" or GradeSubj22 = "H1"
or GradeSubj22 = "D" or GradeSubj22 = "H2A" or
GradeSubj22 = "C" or GradeSubj22 = "H2B" or
GradeSubj22 = "P" or GradeSubj22 = "H3" or
GradeSubj22 = "S", HrsSubj22, 0)
 + If (GradeSubj23 = "HD" or GradeSubj23 = "H1"
or GradeSubj23 = "D" or GradeSubj23 = "H2A" or
GradeSubj23 = "C" or GradeSubj23 = "H2B" or
GradeSubj23 = "P" or GradeSubj23 = "H3" or
GradeSubj23 = "S", HrsSubj23, 0)
 + If (GradeSubj24 = "HD" or GradeSubj24 = "H1"
or GradeSubj24 = "D" or GradeSubj24 = "H2A" or
GradeSubj24 = "C" or GradeSubj24 = "H2B" or
GradeSubj24 = "P" or GradeSubj24 = "H3" or
GradeSubj24 = "S", HrsSubj24, 0)
 + If (GradeSubj25 = "HD" or GradeSubj25 = "H1"
or GradeSubj25 = "D" or GradeSubj25 = "H2A" or
GradeSubj25 = "C" or GradeSubj25 = "H2B" or
GradeSubj25 = "P" or GradeSubj25 = "H3" or
GradeSubj25 = "S", HrsSubj25, 0)
 + If (GradeSubj26 = "HD" or GradeSubj26 = "H1"
or GradeSubj26 = "D" or GradeSubj26 = "H2A" or
GradeSubj26 = "C" or GradeSubj26 = "H2B" or
GradeSubj26 = "P" or GradeSubj26 = "H3" or
GradeSubj26 = "S", HrsSubj26, 0)
 + If (GradeSubj27 = "HD" or GradeSubj27 = "H1"
or GradeSubj27 = "D" or GradeSubj27 = "H2A" or
GradeSubj27 = "C" or GradeSubj27 = "H2B" or
GradeSubj27 = "P" or GradeSubj27 = "H3" or
GradeSubj27 = "S", HrsSubj27, 0)
 + If (GradeSubj28 = "HD" or GradeSubj28 = "H1"
or GradeSubj28 = "D" or GradeSubj28 = "H2A" or
GradeSubj28 = "C" or GradeSubj28 = "H2B" or
GradeSubj28 = "P" or GradeSubj28 = "H3" or
GradeSubj28 = "S", HrsSubj28, 0)
 + If (GradeSubj29 = "HD" or GradeSubj29 = "H1"
or GradeSubj29 = "D" or GradeSubj29 = "H2A" or
GradeSubj29 = "C" or GradeSubj29 = "H2B" or
GradeSubj29 = "P" or GradeSubj29 = "H3" or
GradeSubj29 = "S", HrsSubj29, 0)
 + If (GradeSubj30 = "HD" or GradeSubj30 = "H1"
or GradeSubj30 = "D" or GradeSubj30 = "H2A" or
GradeSubj30 = "C" or GradeSubj30 = "H2B" or
GradeSubj30 = "P" or GradeSubj30 = "H3" or
GradeSubj30 = "S", HrsSubj30, 0)
```

		+ If (GradeSubj31 = "HD" or GradeSubj31 = "H1" or GradeSubj31 = "D" or GradeSubj31 = "H2A" or GradeSubj31 = "C" or GradeSubj31 = "H2B" or GradeSubj31 = "P" or GradeSubj31 = "H3" or GradeSubj31 = "S", HrsSubj31, 0) + If (GradeSubj32 = "HD" or GradeSubj32 = "H1" or GradeSubj32 = "D" or GradeSubj32 = "H2A" or GradeSubj32 = "C" or GradeSubj32 = "H2B" or GradeSubj32 = "P" or GradeSubj32 = "H3" or GradeSubj32 = "S", HrsSubj32, 0) + If (GradeSubj33 = "HD" or GradeSubj33 = "H1" or GradeSubj33 = "D" or GradeSubj33 = "H2A" or GradeSubj33 = "C" or GradeSubj33 = "H2B" or GradeSubj33 = "P" or GradeSubj33 = "H3" or GradeSubj33 = "S", HrsSubj33, 0) + If (GradeSubj34 = "HD" or GradeSubj34 = "H1" or GradeSubj34 = "D" or GradeSubj34 = "H2A" or GradeSubj34 = "C" or GradeSubj34 = "H2B" or GradeSubj34 = "P" or GradeSubj34 = "H3" or GradeSubj34 = "S", HrsSubj34, 0) + If (GradeSubj35 = "HD" or GradeSubj35 = "H1" or GradeSubj35 = "D" or GradeSubj35 = "H2A" or GradeSubj35 = "C" or GradeSubj35 = "H2B" or GradeSubj35 = "P" or GradeSubj35 = "H3" or GradeSubj35 = "S", HrsSubj35, 0) + If (GradeSubj36 = "HD" or GradeSubj36 = "H1" or GradeSubj36 = "D" or GradeSubj36 = "H2A" or GradeSubj36 = "C" or GradeSubj36 = "H2B" or GradeSubj36 = "P" or GradeSubj36 = "H3" or GradeSubj36 = "S", HrsSubj36, 0)
Passed Load	Caulculation (Number)	= Passed Hours / Year_Course_Hours
Progress Ratio	Calculation (Number)	= Passed Load / Completed Load
Mean Progress Ratio	Summary	= Average of Progress Ratio
Mean Aggregate Score	Summary	= Average of Aggregate AdjScore
Mean Success Index	Summary	= Average of Weighted Success Index
Std. Dev. Progress Ratio	Summary	= Standard Deviation of Progress Ratio
Std. Dev. Aggregate Score	Summary	= Standard Deviation of Aggregate AdjScore
Std. Dev. Success Index	Summary	= Standard Deviation of Weighted Success Index
Match Field	Calculation (Text)	= StudentID & "\" & CourseID

Figure 81. Real time routines, program sequences and scripts for success indices feeder file (Indices.FM).

Script Step/Options	Script Procedures, Parameters, Etc.
SCRIPT NAME: **Import STUDRES.TXT**	
1. Import Records Restore import order	Import Order: StudentID (Number) CourseID (Text) CodeSubj01 (Text) MarkSubj01 (Number) GradeSubj01 (Text) CodeSubj02 (Text) MarkSubj02 (Number) GradeSubj02 (Text) CodeSubj03 (Text) MarkSubj03 (Number) GradeSubj03 (Text) CodeSubj04 (Text) MarkSubj04 (Number) GradeSubj04 (Text) CodeSubj05 (Text) MarkSubj05 (Number) GradeSubj05 (Text) CodeSubj06 (Text) MarkSubj06 (Number) GradeSubj06 (Text) CodeSubj07 (Text) MarkSubj07 (Number) GradeSubj07 (Text) CodeSubj08 (Text) MarkSubj08 (Number) GradeSubj08 (Text) CodeSubj09 (Text) MarkSubj09 (Number) GradeSubj09 (Text) CodeSubj10 (Text) MarkSubj10 (Number) GradeSubj10 (Text) CodeSubj11 (Text) MarkSubj11 (Number) GradeSubj11 (Text) CodeSubj12 (Text) MarkSubj12 (Number) GradeSubj12 (Text)

	CodeSubj13 (Text) MarkSubj13 (Number) GradeSubj13 (Text) CodeSubj14 (Text) MarkSubj14 (Number) GradeSubj14 (Text) CodeSubj15 (Text) MarkSubj15 (Number) GradeSubj15 (Text) CodeSubj16 (Text) MarkSubj16 (Number) GradeSubj16 (Text)CodeSubj17 (Text) MarkSubj17 (Number) GradeSubj17 (Text) CodeSubj18 (Text) MarkSubj18 (Number) GradeSubj18 (Text) CodeSubj19 (Text) MarkSubj19 (Number) GradeSubj19 (Text) CodeSubj20 (Text) MarkSubj20 (Number) GradeSubj20 (Text) CodeSubj21 (Text) MarkSubj21 (Number) GradeSubj21 (Text) CodeSubj22 (Text) MarkSubj22 (Number) GradeSubj22 (Text) CodeSubj23 (Text) MarkSubj23 (Number) GradeSubj23 (Text) CodeSubj24 (Text) MarkSubj24 (Number) GradeSubj24 (Text) CodeSubj25 (Text) MarkSubj25 (Number) GradeSubj25 (Text) CodeSubj26 (Text) MarkSubj26 (Number) GradeSubj26 (Text) CodeSubj27 (Text) MarkSubj27 (Number) GradeSubj27 (Text) CodeSubj28 (Text) MarkSubj28 (Number)

	GradeSubj28 (Text) CodeSubj29 (Text) MarkSubj29 (Number) GradeSubj29 (Text) CodeSubj30 (Text) MarkSubj30 (Number) GradeSubj30 (Text) CodeSubj31 (Text) MarkSubj31 (Number) GradeSubj31 (Text) CodeSubj32 (Text) MarkSubj32 (Number) GradeSubj32 (Text) CodeSubj33 (Text) MarkSubj33 (Number) GradeSubj33 (Text) CodeSubj34 (Text) MarkSubj34 (Number) GradeSubj34 (Text) CodeSubj35 (Text) MarkSubj35 (Number) GradeSubj35 (Text) CodeSubj36 (Text) MarkSubj36 (Number) GradeSubj36 (Text)

SCRIPT NAME: **ReLookup SUBJECT DATA**	
1. Relookup No dialog	CodeSubj01
2. Relookup No dialog	Code Subj02
3. Relookup No dialog	Code Subj03
4. Relookup No dialog	Code Subj04
5. Relookup No dialog	Code Subj05
6. Relookup No dialog	Code Subj06
7. Relookup No dialog	Code Subj07

8. Relookup No dialog	Code Subj08
9. Relookup No dialog	Code Subj09
10. Relookup No dialog	Code Subj10
11. Relookup No dialog	Code Subj11
12. Relookup No dialog	Code Subj12
13. Relookup No dialog	Code Subj13
14. Relookup No dialog	Code Subj14
15. Relookup No dialog	Code Subj15
16. Relookup No dialog	Code Subj16
17. Relookup No dialog	Code Subj17
18. Relookup No dialog	Code Subj18
19. Relookup No dialog	Code Subj19
20. Relookup No dialog	Code Subj20
21. Relookup No dialog	Code Subj21
22. Relookup No dialog	Code Subj22
23. Relookup No dialog	Code Subj23
24. Relookup No dialog	Code Subj24
25. Relookup No dialog	Code Subj25
26. Relookup No dialog	Code Subj26
27. Relookup No dialog	Code Subj27

28. Relookup No dialog	Code Subj28
29. Relookup No dialog	Code Subj29
30. Relookup No dialog	Code Subj30
31. Relookup No dialog	Code Subj31
32. Relookup No dialog	Code Subj32
33. Relookup No dialog	Code Subj33
34. Relookup No dialog	Code Subj34
35. Relookup No dialog	Code Subj35
36. Relookup No dialog	Code Subj36

SCRIPT NAME **Reset Semesters Elapsed** 1. Find All	
2. Go to Field (Select/play)	No. of Semesters Elapsed
3. Pause/Resume Script	
4. Replace	No. of Semesters Elapsed

SCRIPT NAME **ReLookup ALL** 1. Go to Layout (Refresh screen)	Lookup Fields
2. Find All	
3. Relookup (No dialog)	StudentID
4. Relookup (No dialog)	CourseID
5. Perform Script (Sub-scripts)	ReLookup from subj01-7
6. Perform Script (Sub-scripts)	ReLookup from subj08-10
7. Perform Script	ReLookup from subj11-13

(Sub-scripts)	

8. Perform Script (Sub-scripts)	ReLookup from subj14-17
9. Perform Script (Sub-scripts)	ReLookup from subj18-21
10. Perform Script (Sub-scripts)	ReLookup from subj22-25
11. Perform Script (Sub scripts)	ReLookup from subj26-29
12. Perform Script (Sub-scripts)	ReLookup from subj30-36
13. Go to Layout	original layout

SCRIPT NAME **ReLookup from subj01-7**	
1. Relookup (No dialog)	CodeSubj01
2. Relookup (No dialog)	CodeSubj02
3. Relookup (No dialog)	CodeSubj03
4. Relookup (No dialog)	CodeSubj04
5. Relookup (No dialog)	CodeSubj05
6. Relookup (No dialog)	CodeSubj06
7. Relookup (No dialog)	CodeSubj07

SCRIPT NAME **ReLookup from subj08-10**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj09
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj08

7. Relookup (No dialog)	CodeSubj09
8. Relookup (No dialog)	CodeSubj10

SCRIPT NAME **ReLookup from subj11-13**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj09
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj11
7. Relookup (No dialog)	CodeSubj12
8. Relookup (No dialog)	CodeSubj13

SCRIPT NAME **ReLookup from subj14-17**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj14
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj14

7. Relookup (No dialog)	CodeSubj15
8. Relookup (No dialog)	CodeSubj16
9. Relookup (No dialog)	CodeSubj17

SCRIPT NAME **ReLookup from subj18-21**	
1. Go to Layout	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj17
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj18
7. Relookup (No dialog)	CodeSubj19
8. Relookup (No dialog)	CodeSubj20
9. Relookup (No dialog)	CodeSubj21

SCRIPT NAME **ReLookup from subj22-25**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj22
4. Paste Literal	Data: >0
5. Perform Find	Requeset 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj22

7. Relookup (No dialog)	CodeSubj23
8. Relookup (No dialog)	CodeSubj24
9. Relookup (No dialog)	CodeSubj25

SCRIPT NAME **ReLookup from subj26-29**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj26
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj26
7. Relookup (No dialog)	CodeSubj27
8. Relookup (No dialog)	CodeSubj28
9. Relookup (No dialog)	CodeSubj29

SCRIPT NAME **ReLookup from subj30-36**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Enter Find Mode	Request 1 CodeSubj09 =
3. Go to Field (Select/play)	CodeSubj30
4. Paste Literal	Data: >0
5. Perform Find	Request 1 CodeSubj09 =
6. Relookup (No dialog)	CodeSubj30

7. Relookup (No dialog)	CodeSubj31
8. Relookup (No dialog)	CodeSubj32
9 Relookup (No dialog)	CodeSubj33
10. Relookup (No dialog)	CodeSubj34
11. Relookup (No dialog)	CodeSubj35
12. Relookup (No dialog)	CodeSubj36

SCRIPT NAME **Find SCM1401**	
1. Perform Find (Restore find requests)	Request 1 CodeSubj01 SCM1401 Request 2 CodeSubj02 SCM1401 Request 3 CodeSubj03 SCM1401 Request 4 CodeSubj04 SCM1401 Request 5 CodeSubj05 SCM1401 Request 6 CodeSubj06 SCM1401 Request 7 CodeSubj07 SCM1401 Request 8 CodeSubj08 SCM1401 Request 9 CodeSubj09 SCM1401 Request 10 CodeSubj10 SCM1401 Request 11 CodeSubj11 SCM1401 Request 12 CodeSubj12 SCM1401 Request 13 CodeSubj13 SCM1401 Request 14 CodeSubj14 SCM1401

	Request 15 CodeSubj15 SCM1401 Request 16 CodeSubj16 SCM1401 Request 17 CodeSubj17 SCM1401 Request 18 CodeSubj18 SCM1401 Request 19 CodeSubj19 SCM1401 Request 20 CodeSubj20 SCM1401 Request 21 CodeSubj21 SCM1401 Request 22 CodeSubj22 SCM1401 Request 23 CodeSubj23 SCM1401 Request 24 CodeSubj24 SCM1401 Request 25 CodeSubj25 SCM1401 Request 26 CodeSubj26 SCM1401 Request 27 CodeSubj27 SCM1401 Request 28 CodeSubj28 SCM1401 Request 29 CodeSubj29 SCM1401 Request 30 CodeSubj30 SCM1401 Request 31 CodeSubj31 SCM1401 Request 32 CodeSubj32 SCM1401 Request 33 CodeSubj33 SCM1401 Request 34 CodeSubj34 SCM1401 Request 35 CodeSubj35 SCM1401 Request 36 CodeSubj36 SCM1401
2. Go to Layout	text screen

SCRIPT NAME **ReLookup ALL Copy**	
1. Go to Layout (Refresh screen)	Lookup Fields
2. Find All	
3. Perform Script (with Sub-scripts)	ReLookup from subj08-10
4. Perform Script (with Sub-scripts)	ReLookup from subj11-13
5. Perform Script (with Sub-scripts)	ReLookup from subj14-17
6. Perform Script (with Sub-scripts)	ReLookup from subj18-21
7. Perform Script (with Sub-scripts)	ReLookup from subj22-25
8. Perform Script (with Sub-scripts)	ReLookup from subj26-29
9. Perform Script (with Sub-scripts)	ReLookup from subj30-36
10. Go to Layout	original layout

Part 15: Appendices.

Appendix 5.

Algorithms used in the software design, for the purposes of arriving at the success index have been extracted and reproduced in text form below, with brief explanatory notes.

Algorithms used in Calculation of the Success Index

Expanded definition of Success Index:

A measure of academic achievement based on a cumulative weighted average of marks attained in subject course assessment adjusted positively by up to 25% according to an inverse of the student's stated grade aims and negatively in proportion to any shortfall between the students' stated progress aims and actual progress rate.

Figure 82. Extract of logical syntax from which the algorithm for the success index was compiled.

```
Round (
If (Grade Aims = "3", Aggregate AdjScore * 1.25, If (Grade Aims =
"2", Aggregate AdjScore * 1.11, Aggregate AdjScore)) *
If ((Rate = 2 and Passed Load < (0.3375 * No. of Semesters Elapsed)),
(Passed Load / (0.3375 * No. of Semesters Elapsed)), If((Rate ≥ 3 and
Passed Load < (0.45 * No. of Semesters Elapsed)), (Passed Load / (0.45
* No. of Semesters Elapsed)), 1))
, 1)
```

Function Syntax for Interpretation of Formula Structure:

Round (number, precision)

If (Test, Result_if_true, Result_if_false)

Part 15: Appendices.

Appendix 6.

Country of Origin Frequency Table.

Figure 83. Full breakdown by country of birth, of 877 participating students who were born outside Australia (83 country categories are represented):

Country	Number of Students	Region
Argentina	8	South America
Austria	1	Europe
Bangladesh	1	Central Asia
Belgium	1	Europe
Brazil	2	South America
Cambodia	21	South-East Asia
Canada	5	North America
Chile	10	South America
China	30	North-East Asia
Columbia	2	South America
Croatia	2	Europe
Cyprus	7	Europe
Czechoslovakia	2	Europe
Denmark	1	Europe
Egypt	1	Middle East
El Salvador	12	South America
England	11	Europe
Fiji	5	Pacific Countries
France	2	Europe
Germany - East	6	Europe
Germany - West	6	Europe
Greece	9	Europe
Hong Kong	42	North-East Asia
Hungary	3	Europe
India	12	Central Asia
Indonesia (including Timor)	20	South-East Asia
Iran	5	Middle East
Ireland, Republic of	8	Europe

Israel	3	Middle East
Italy	13	Europe
Japan	3	North-East Asia
Jordan	1	Middle East
Kenya	1	Africa
Korea - South	2	North-East Asia
Kuwait	1	Middle East
Laos	12	South-East Asia
Lebanon	9	Middle East
Macau	2	North-East Asia
Malawi	2	Africa
Malaysia	18	South-East Asia
Malta	4	Europe
Netherlands	3	Europe
New Caledonia	2	Pacific Countries
New Zealand	22	Pacific Countries
Northern Ireland	1	Europe
Other Eastern European	1	Europe
Other Northern European Country	1	Europe
Other Southern European	2	Europe
Pakistan	2	Central Asia
Papua New Guinea	7	Pacific Countries
Peru	4	South America
Philippines	32	Pacific Countries
Poland	21	Europe
Portugal	6	Europe
Romania	4	Europe
Scotland	2	Europe
Singapore	12	South-East Asia
Solomon Islands	1	Pacific Countries
South Africa	10	Africa
Sri Lanka	20	Central Asia
Sweden	1	Europe
Syria	1	Middle East
Taiwan	8	North-East Asia
Tanzania	1	Africa
Thailand	3	South-East Asia
Turkey	15	Middle East

U.K. (including Nth Ireland)	61	Europe
U.S.A.	4	North America
U.S.S.R. (incl. Estonia, Latvia, Mongolia)	9	USSR
Uganda	1	Africa
United Arab Emirates	1	Middle East
Uruguay	1	South America
Vietnam	255	South-East Asia
Yugoslavia	15	Europe
Zambia	1	Africa
Zimbabwe	1	Africa
An Indian Ocean Country	5	Africa
An Unlisted African Country	18	Africa
An Unlisted Asian or Middle East Country	2	Middle East
An Unlisted Asian or Middle East Country	4	Middle East
An Unlisted Overseas Country	8	Pacific Countries
An Unlisted Pacific Ocean Country	2	Pacific Countries
An Unlisted South American Country	1	South America

Part 15: Appendices.

Appendix 7.

Table of Tertiary Entry Scores.

Figure 84. Full breakdown of scored tertiary entrants in 1994, showing the number of students at each TER level

Tertiary Entrance Score	Number of Students
<=60	18
061	3
062	2
063	4
064	5
065	1
066	2
067	1
068	7
069	7
070	1
071	5
072	9
073	5
074	7
075	4
076	4
077	6
078	8
079	9
080	10
081	14
082	15
083	12
084	16
085	15
086	27
087	30
088	24
089	35
090	29
091	22
092	30
093	30
094	28
095	25
096	31
097	40
098	41
099	41
100	47
101	43
102	33
103	49
104	30
105	38
106	46
107	33
108	51
109	40
110	27
111	27
112	24
113	30
114	22
115	30
116	24
117	23
118	22
119	26
120	30
121	26
122	24
123	25
124	28
125	22
126	20
127	17
128	15
129	21
130	14
131	17
132	22
133	19
134	13
135	15
136	11
137	14
138	9
139	9
140	8
>=141	46

Part 15: Appendices.

Appendix 8.

Cross-Tabulation of Entry Scores and Academic Performance.

Figure 85. Table of scored tertiary entrants in 1994, showing the number of students and their first year university results at each score level from 60 to 140 (from year 12 tertiary entry scores obtained by students in 1993, the first year of implementation of the VCE).

Tertiary Entrance Score	Number of Students	Mean Progress Ratio	Std. Dev., Prog Patio	Weighted Average Mark (W.A.M.)	Std. Dev., W.A.M.
<=60	18	59.9	31.36	48.6	10.73
061	3	34.7	25.08	35.1	16.76
062	2	12.5	12.50	30.8	10.75
063	4	40.5	29.07	41.1	10.75
064	5	73.0	23.51	56.6	9.67
065	1	85.7	0.00	57.4	0.00
066	2	62.4	29.08	57.0	10.29
067	1	95.7	0.00	64.4	0.00
068	7	54.5	28.36	51.9	11.27
069	7	54.6	37.97	44.8	20.83
070	1	100.0	0.00	64.9	0.00
071	5	50.5	35.06	44.4	13.21
072	9	64.2	28.78	49.4	16.62
073	5	51.7	40.85	50.1	17.84
074	7	37.6	37.96	36.3	18.52
075	4	73.0	42.27	52.3	18.86
076	4	10.8	7.26	28.0	6.23
077	6	36.4	26.08	41.5	14.31
078	8	38.3	38.21	44.1	16.86
079	9	34.1	39.69	37.4	18.27
080	10	51.6	40.22	46.7	18.70
081	14	60.1	32.34	50.2	14.34
082	15	37.9	34.92	42.0	16.20
083	12	54.3	42.84	46.8	20.97
084	16	50.7	34.95	43.8	17.01
085	15	42.8	39.97	44.3	17.27
086	27	66.4	34.67	50.4	13.86

087	30	54.6	40.34	47.3	15.75
088	24	64.3	36.48	50.9	13.52
089	35	72.1	29.49	53.7	11.74
090	29	71.1	33.94	56.0	13.10
091	22	60.4	38.85	50.6	16.55
092	30	55.7	37.49	46.3	15.36
093	30	58.0	38.07	47.8	15.50
094	28	63.3	36.67	50.4	13.61
095	25	81.3	27.03	58.4	11.56
096	31	59.0	35.88	48.9	15.66
097	40	55.3	38.83	47.0	16.38
098	41	63.9	36.78	49.6	16.68
099	41	62.0	39.56	49.9	14.86
100	47	60.7	38.41	48.4	14.76
101	43	71.4	29.19	55.7	10.76
102	33	56.3	36.71	48.8	14.14
103	49	62.6	33.38	50.5	14.02
104	30	56.1	33.27	49.6	14.21
105	38	59.5	34.16	51.0	12.54
106	46	64.0	36.12	51.8	15.25
107	33	66.9	32.97	53.1	12.31
108	51	64.0	34.83	52.3	13.16
109	40	62.7	37.00	51.6	16.09
110	27	64.9	35.24	51.7	14.79
111	27	76.2	31.16	56.4	11.43
112	24	63.0	39.52	49.2	18.15
113	30	74.5	26.24	57.4	10.70
114	22	69.1	37.51	53.0	16.84
115	30	63.2	37.04	51.1	15.78
116	24	57.0	38.29	50.1	16.75
117	23	76.7	32.30	57.4	15.13
118	22	73.0	32.52	56.0	16.62
119	26	65.8	39.14	52.2	18.69
120	30	69.5	35.15	53.7	16.97
121	26	80.2	25.07	56.0	12.23
122	24	78.6	28.30	57.4	13.55
123	25	83.5	18.91	58.9	9.59
124	28	78.3	28.60	55.4	14.78
125	22	83.9	24.48	62.1	10.41
126	20	80.8	26.62	60.0	14.05
127	17	70.9	31.05	54.2	13.47
128	15	80.4	27.99	59.7	12.79
129	21	80.4	29.10	60.3	11.78

130	14	77.9	30.18	57.2	14.43
131	17	73.4	33.79	58.4	17.41
132	22	76.8	23.64	56.9	9.13
133	19	75.3	27.53	56.6	12.91
134	13	81.8	19.28	57.3	11.94
135	15	75.8	39.82	58.5	13.12
136	11	81.5	21.07	59.3	8.41
137	14	77.8	34.90	60.8	12.87
138	9	85.3	21.46	60.0	8.59
139	9	71.4	33.87	54.8	15.27
140	8	80.4	31.08	59.1	15.74
>=141	46	85.2	20.12	62.4	10.65

Part 15: Appendices.

Appendix 9.

Sample Group Profile Charts

Figure 86. Graph representing the fifteen indicator profile of sample group 1; participants who were school leavers with related prior studies.

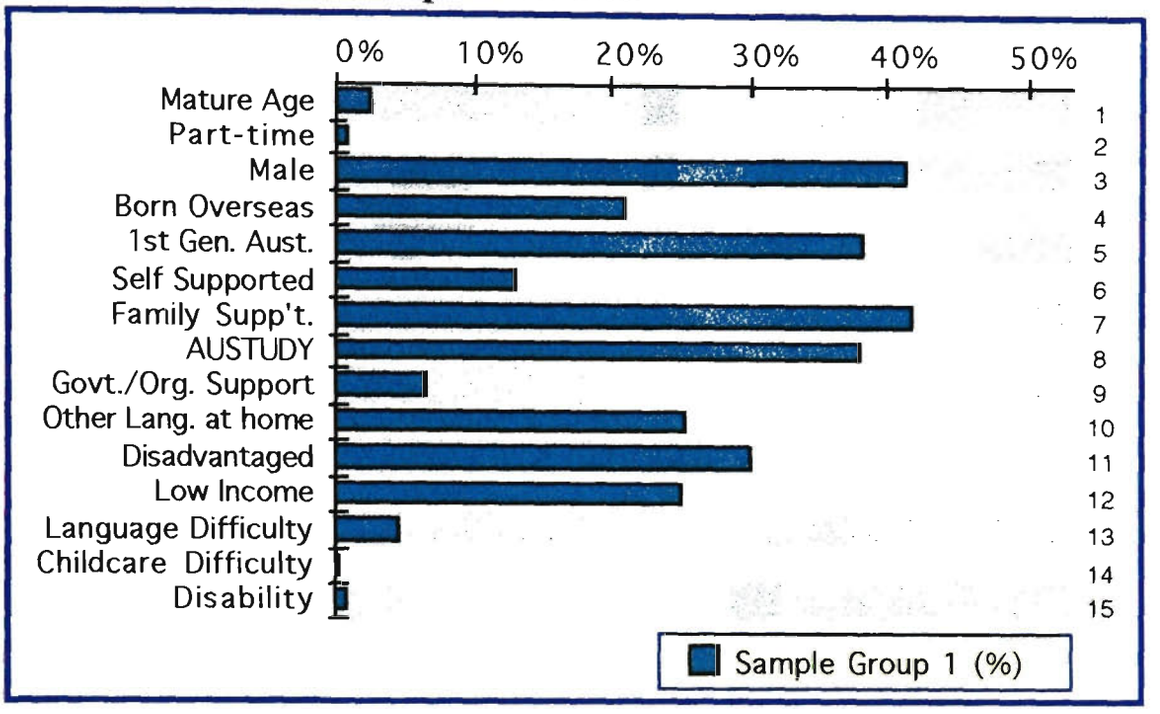

Figure 87. Graph representing the fifteen indicator profile of sample group 2; participants who were school leavers with unrelated prior studies.

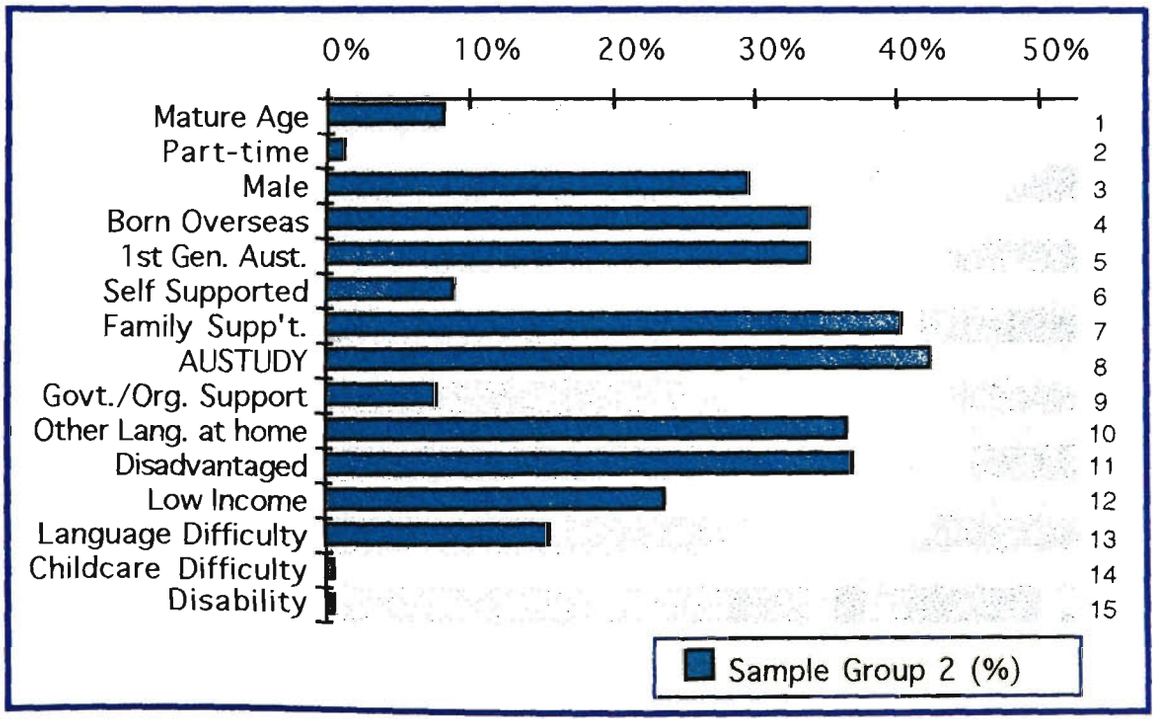

Figure 88. Graph representing the fifteen indicator profile of sample group 3; participants with incomplete secondary with ≥2 yrs relevant work experience

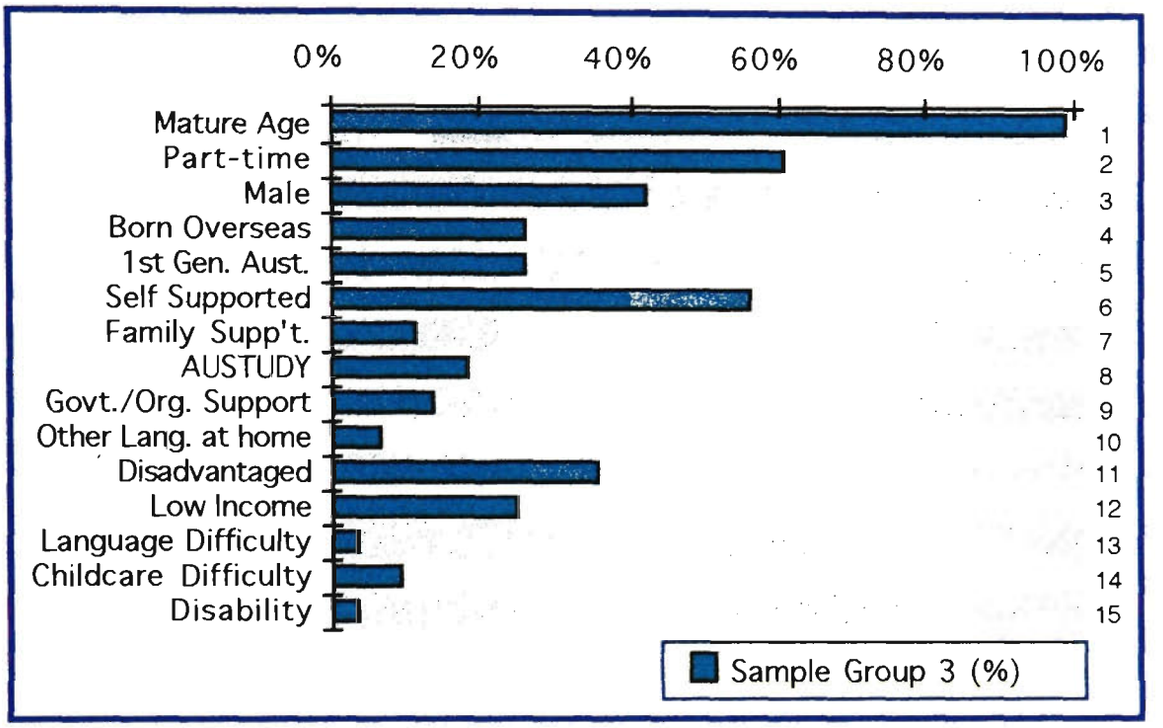

Figure 89. Graph representing the fifteen indicator profile of sample group 4; participants with incomplete secondary with ≥2 yrs unrelated work experience

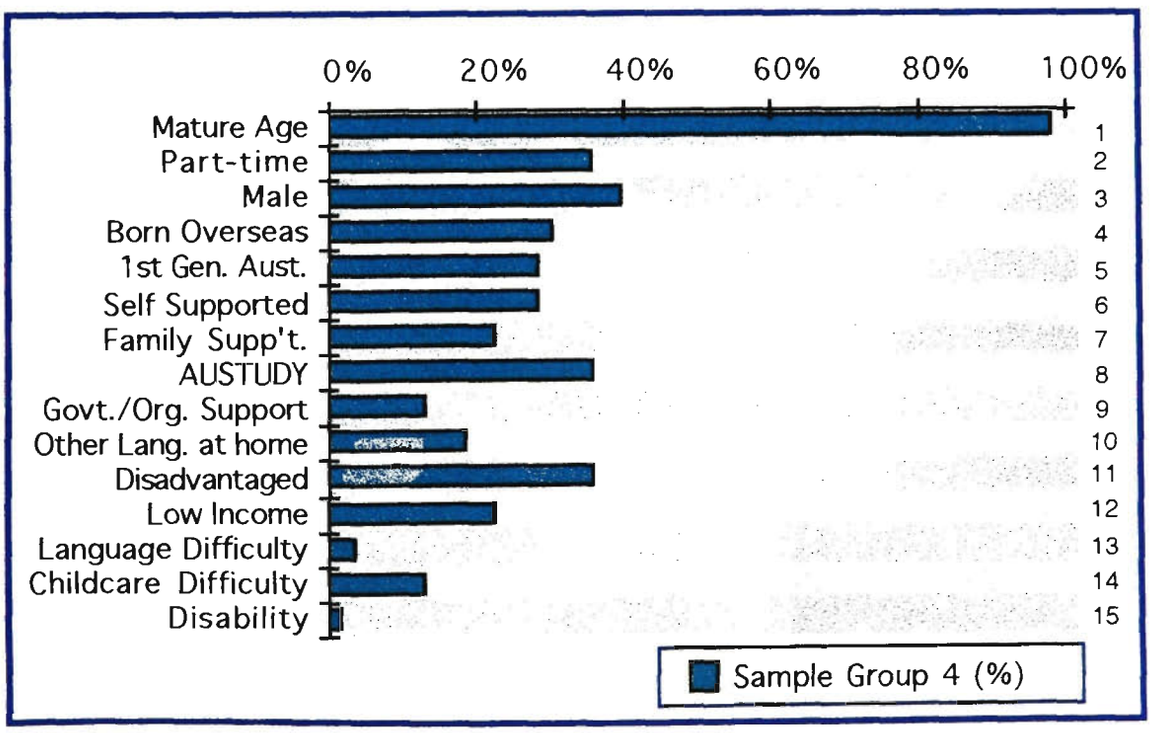

Figure 90. Graph representing the fifteen indicator profile of sample group 5; participants with related prior studies (yr 12) plus 2 to 5 yrs relevant work experience

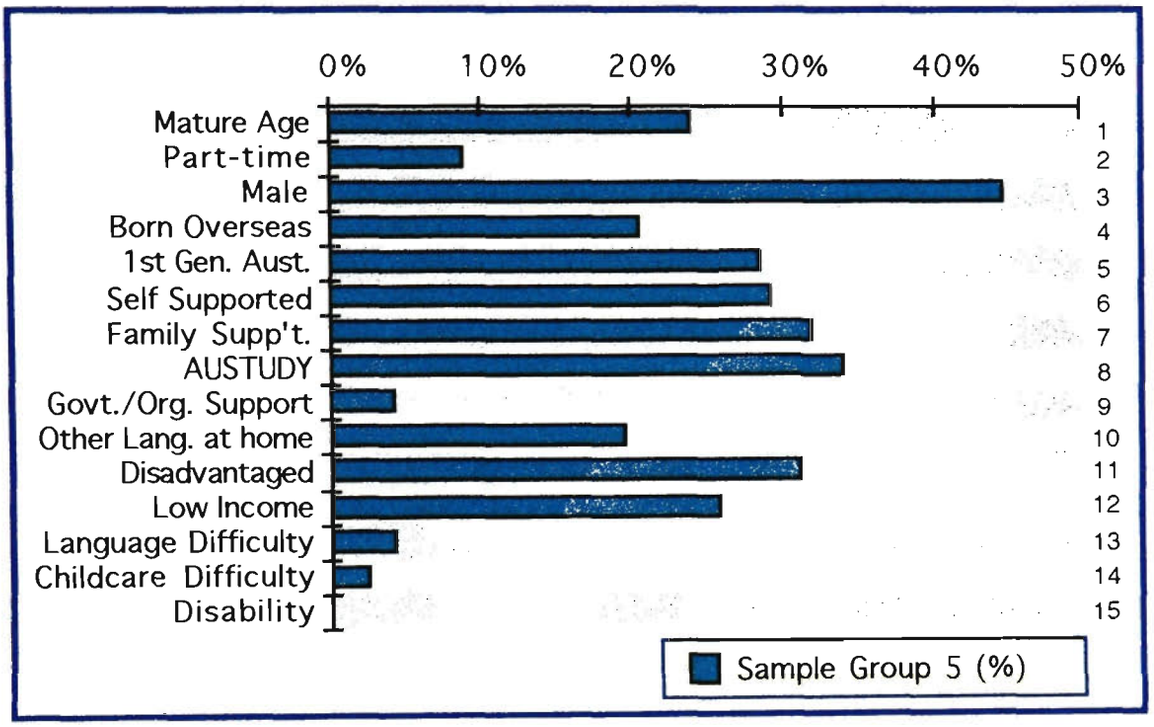

Figure 91. Graph representing the fifteen indicator profile of sample group 6; participants who are mature age with ≥5 yrs relevant work experience

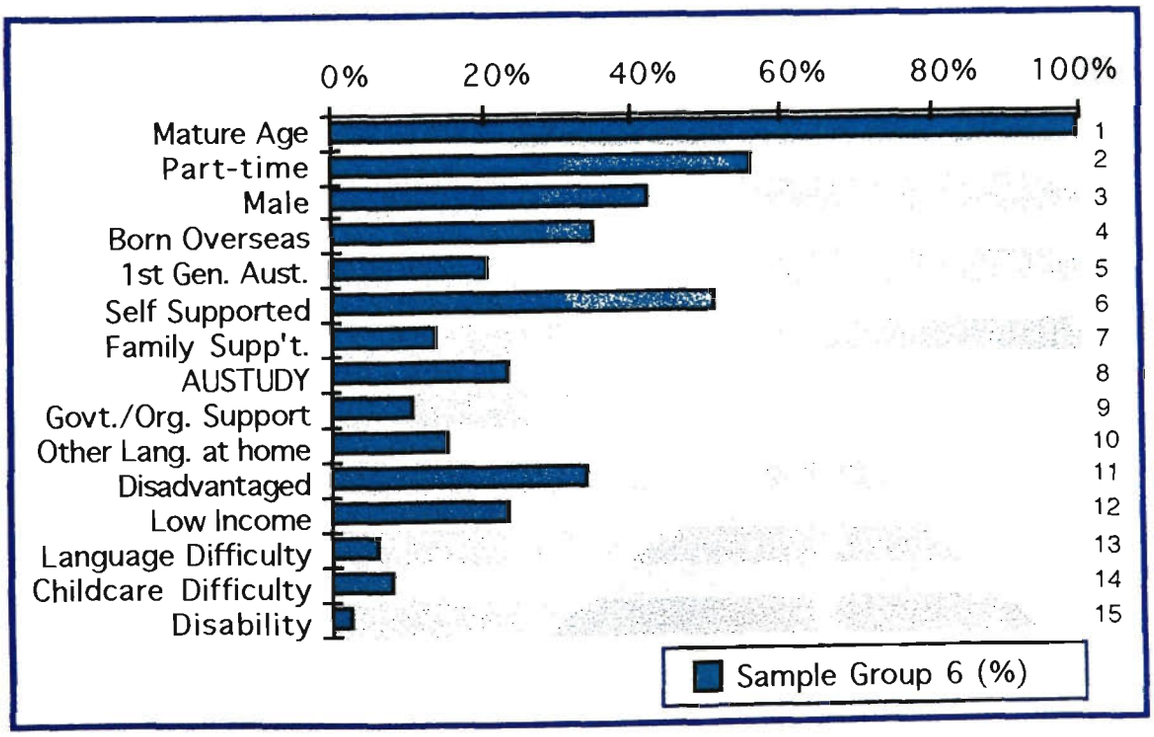

Figure 92. Graph representing the fifteen indicator profile of sample group 7; participants who are mature age with <1 yr related exp. but ≥5 yrs unrelated work experience

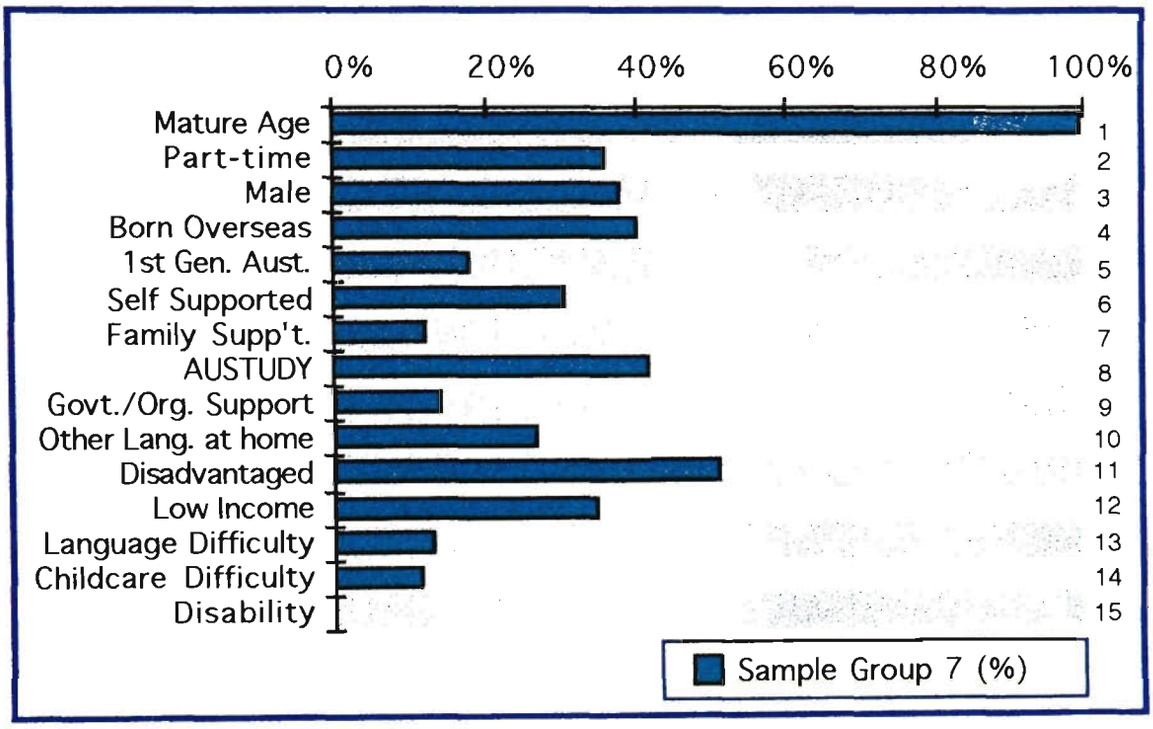

Figure 93. Graph representing the fifteen indicator profile of sample group 8; participants with unrelated prior studies but ≥2 yrs relevant work experience.

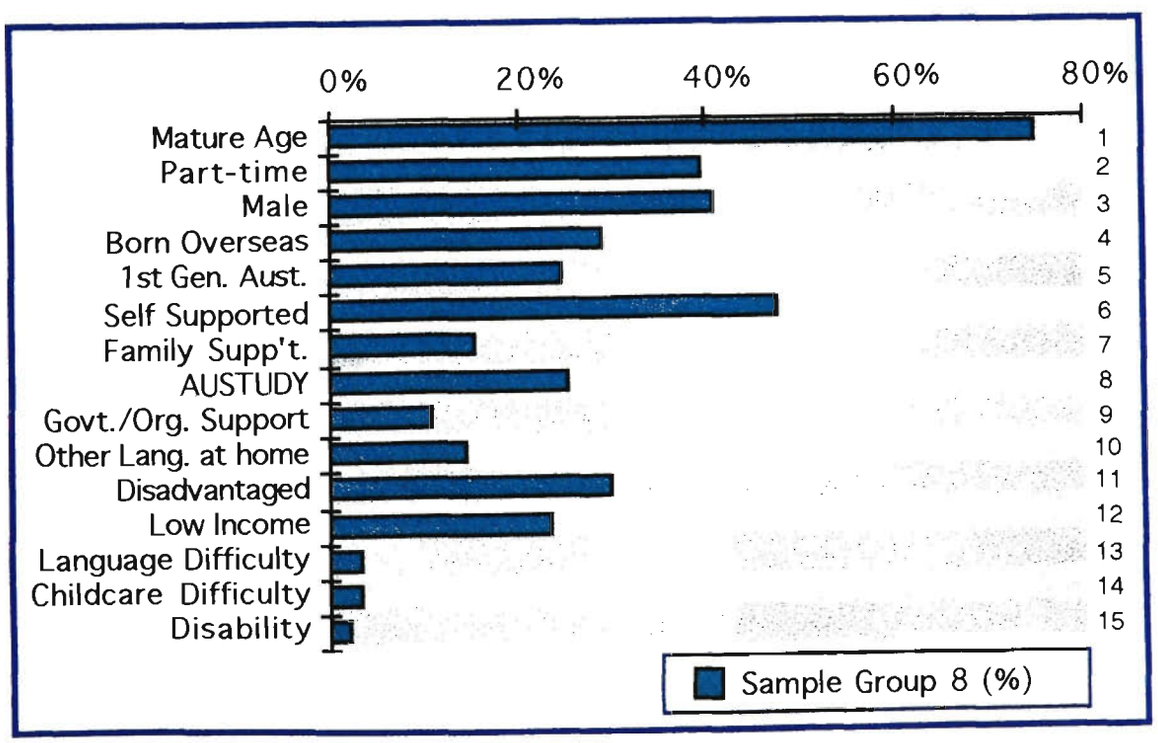

Figure 94. Graph representing the fifteen indicator profile of sample group 9; participants with 2 to 5 yrs related work experience plus 2 to 5 yrs unrelated work experience

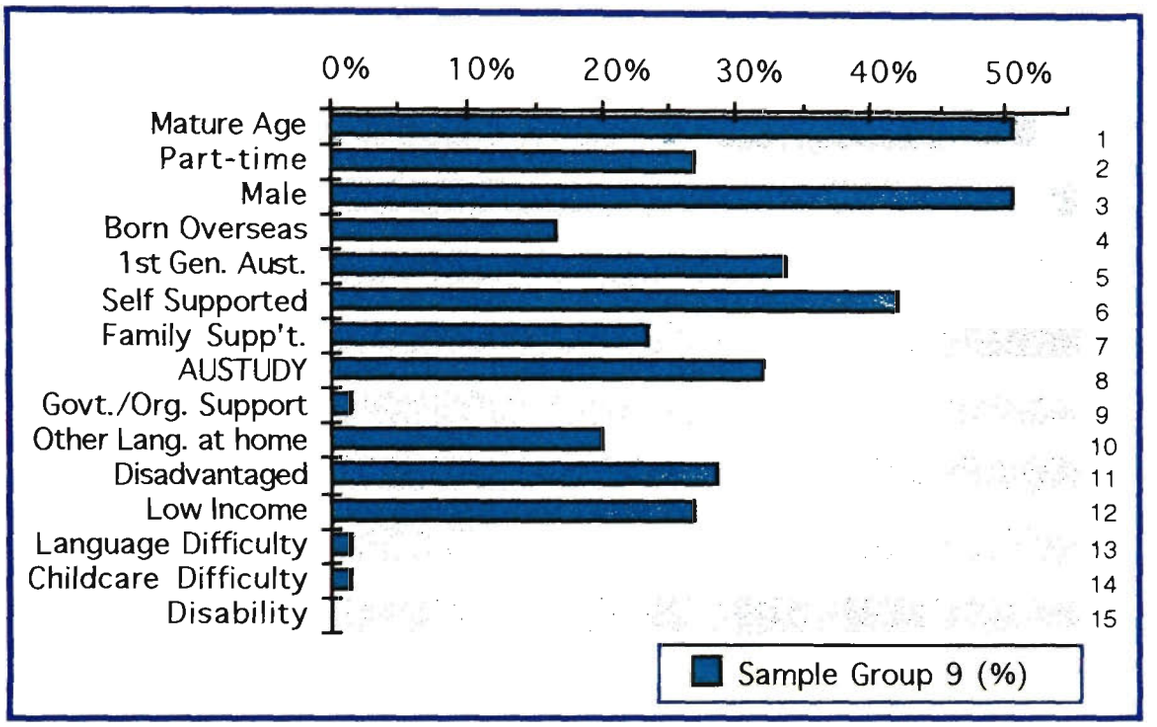

Figure 95. Graph representing the fifteen indicator profile of sample group 10; participants with ≥5 yrs related work experience plus ≥5 yrs unrelated work experience

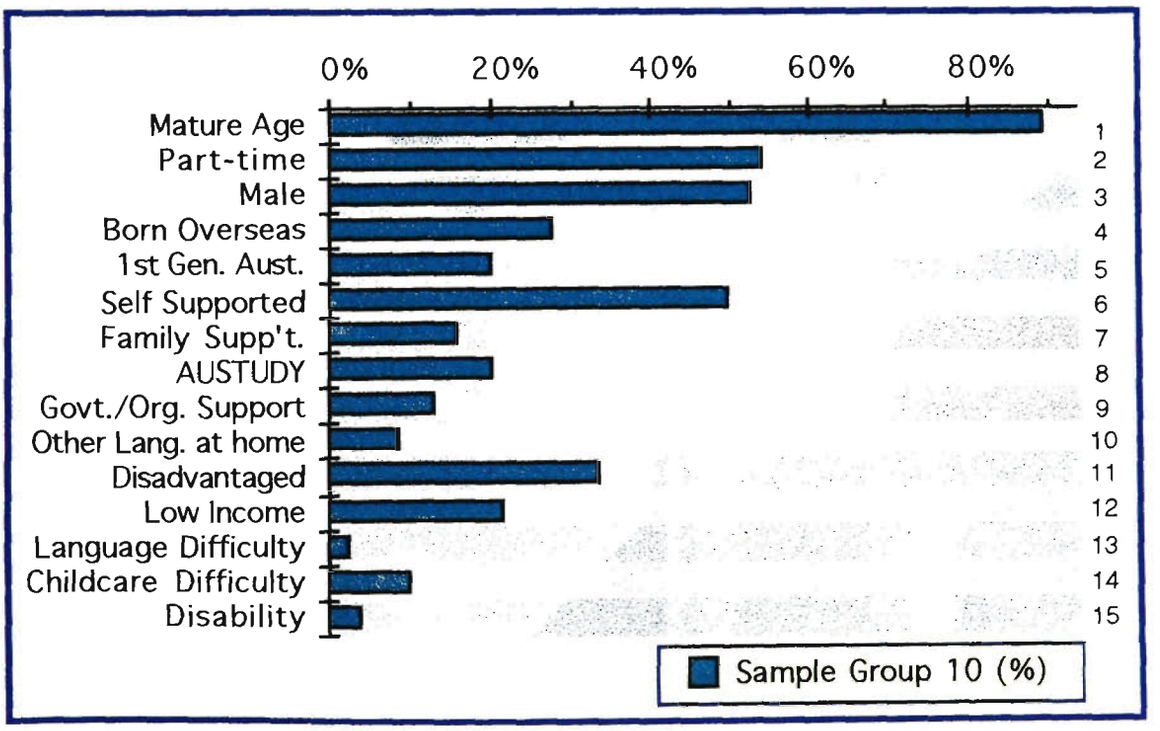

Figure 96. Graph representing the fifteen indicator profile of sample group 11; participants with no related prior studies or work experience.

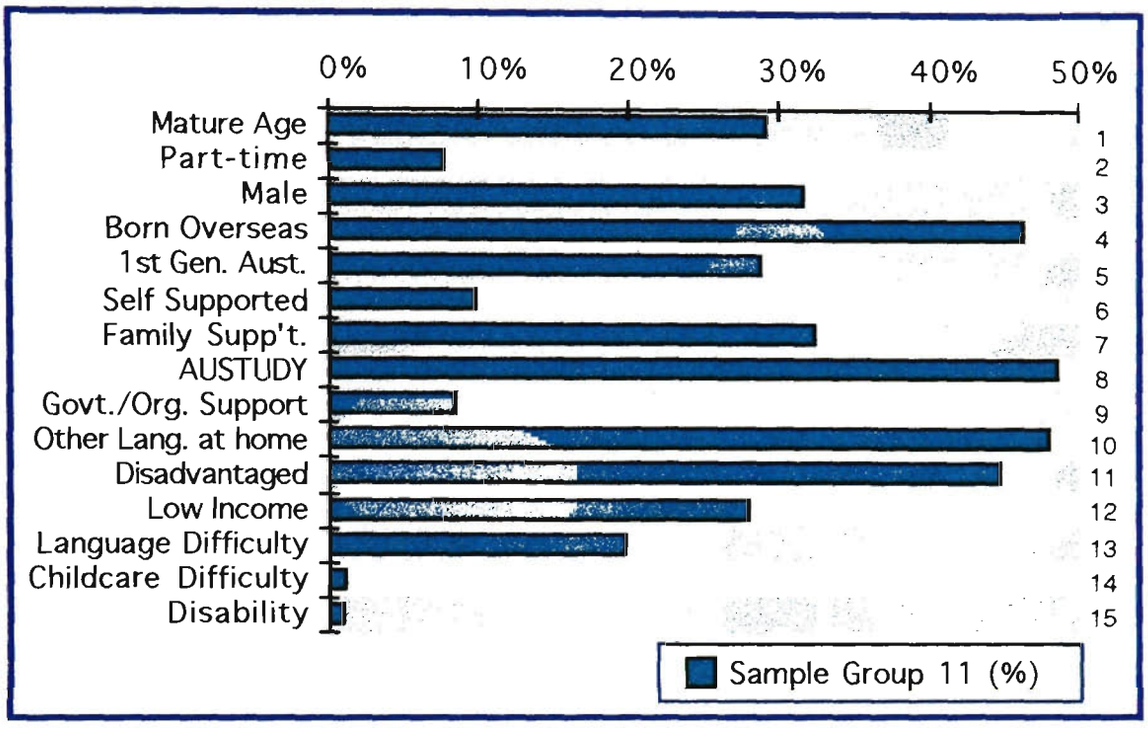

Figure 97. Graph representing the fifteen indicator profile of sample group 12; participants citing one or more type of difficulty/disadvantage.

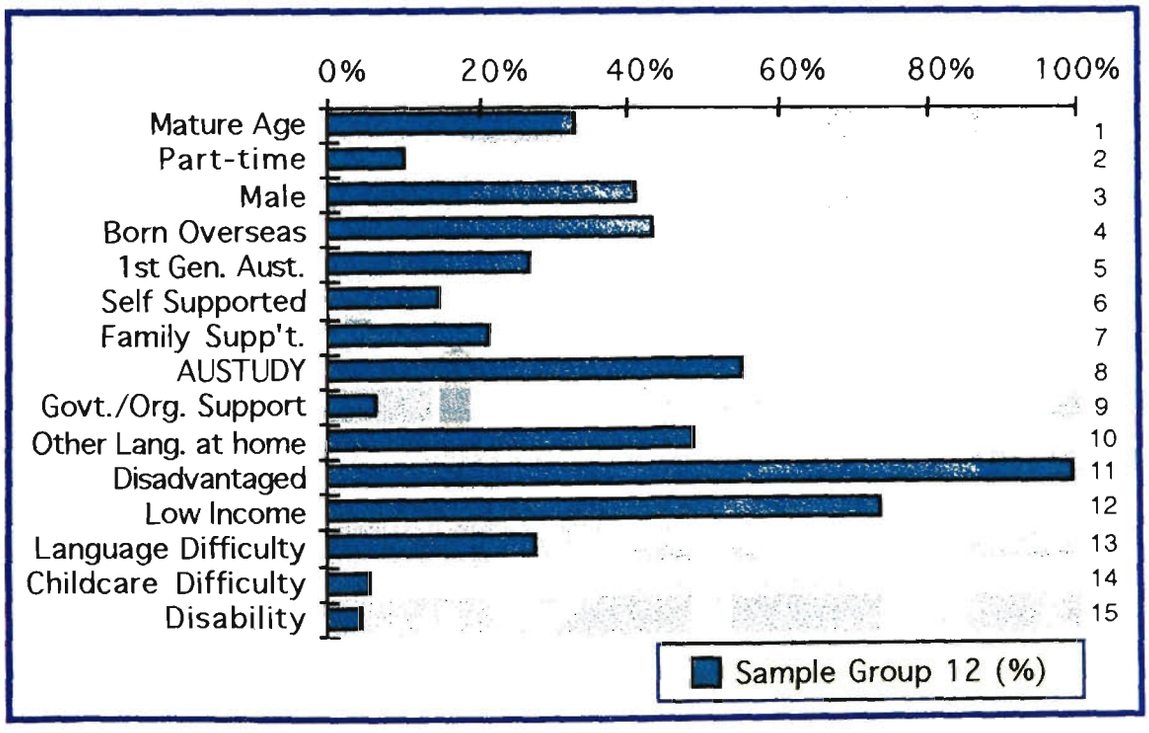

Figure 98. Graph representing the fifteen indicator profile of sample group 13; participants in the age range from 25 to 35 yrs.

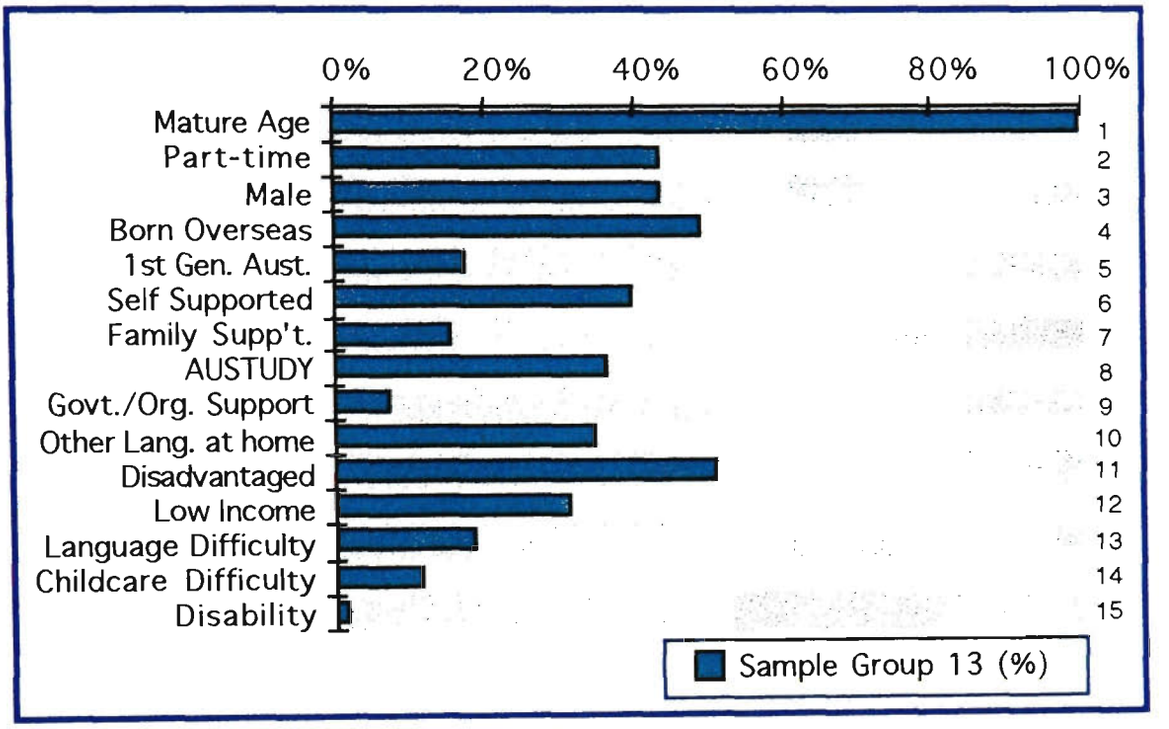

Figure 99. Graph representing the fifteen indicator profile of sample group 14; participants in the age range of 36 and above.

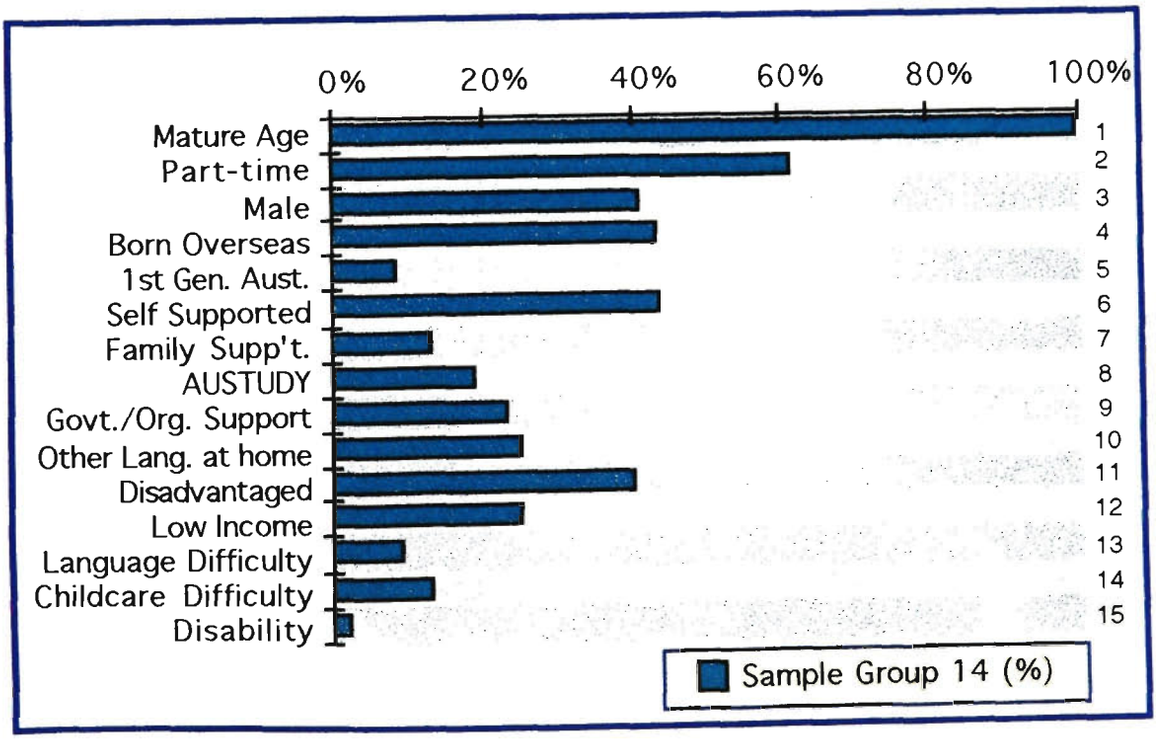

Figure 100. Graph representing the fifteen indicator profile of sample group 15; participants who have been independent ≥2 yrs and self supporting (including Austudy).

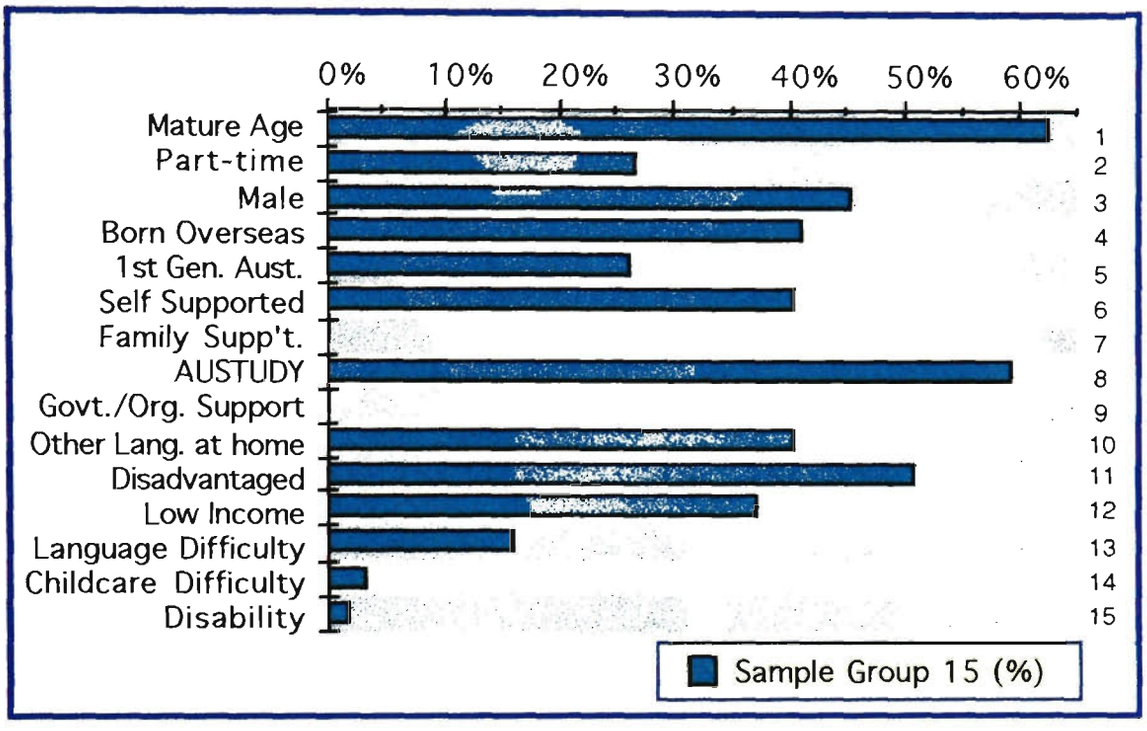

Figure 101. Graph representing the fifteen indicator profile of sample group 16; participants in the age range <25 yrs and studying part-time.

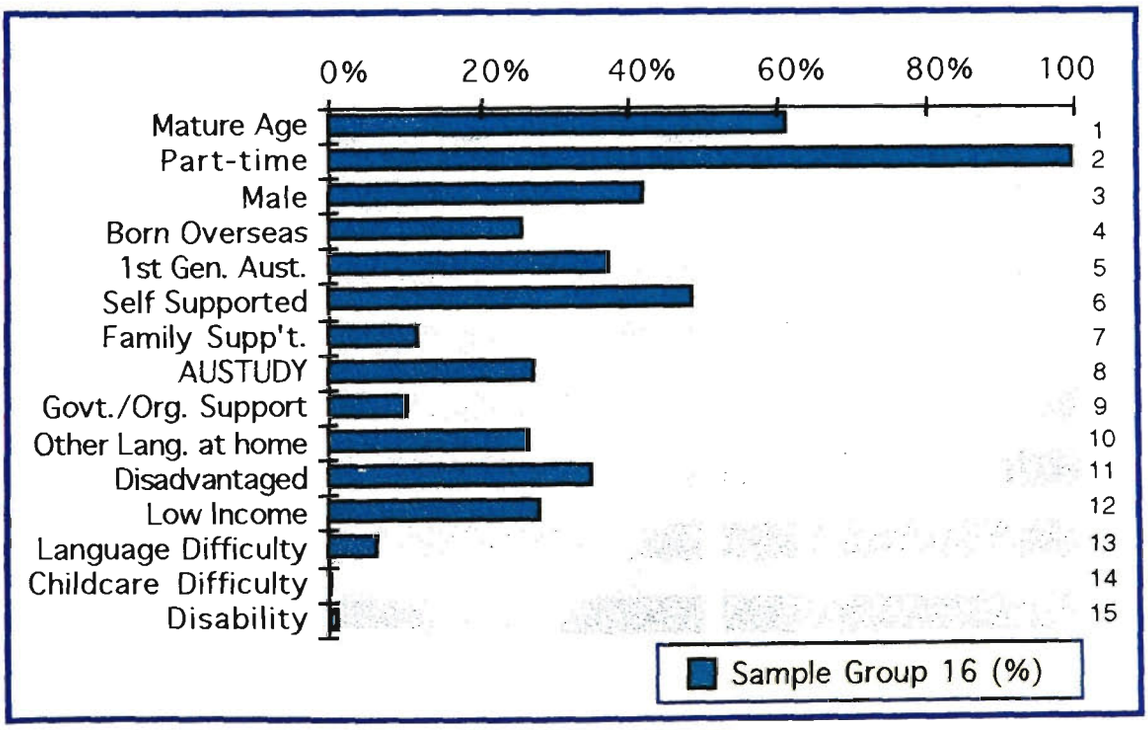

Figure 102. Tabular profile of the 592 participants who did not meet the criteria for selection into any of the sixteen trial sample groups.

	<<<← Profiling Indicators →>>														
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
(i)	19	0	202	110	251	56	314	186	36	148	0	0	0	0	0
(ii)	3.2	0.0	34.1	18.6	42.4	9.5	53.0	31.4	6.1	25.0	0.0	0.0	0.0	0.0	0.0
(iii)	25.5	11.2	39.3	29.9	34.1	18.6	33.3	40.9	7.2	32.4	37.6	27.8	10.4	2.3	1.7
(iv)	-22.3	-11.2	-5.2	-11.3	+8.3	-9.1	+19.8	-9.5	-1.1	-7.4	-37.6	-27.8	-10.4	-2.3	-1.7

KEY TO PROFILING INDICATORS (columns):

A: Mature Age
B: Part-time
C: Male
D: Born Overseas
E: 1st Gen. Australian
F: Self Supported
G: Family Supported
H: Austudy/Abstudy`
I: Gov't/Org Support
J: Other Lang. at home
K: Disadvantaged
L: Low Income
M: Language Difficulty
N: Childcare Difficulty
O: Disability

KEY TO PROFILES (rows):

(i) Number of participants not selected for any of the sixteen sample groups.
(ii) Participants not selected as a percentage of the whole group not selected.
(iii) Profile of all participants (in percentages) for reference purposes).
(iv) Profile variation {Δ%; (ii) minus (iii)}.

Figure 103. Graph representing the fifteen indicator profile of the group of 592 participants who did not meet the criteria for selection to any of the sixteen trial sample groups.