AN INVESTIGATION INTO THE INFLUENCE OF PRE-ADMISSION STUDENT ATTRIBUTES ON ACADEMIC PERFORMANCE AMONG MANAGEMENT STUDENTS:- CASE OF COOPERATIVE MANAGEMENT PROGRAMME,COOPERATIVE COLLEGE OF KENYA,NAIROBI.

BY

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A Management Research Project Submitted in Partial Fulfillment of the Requirements for the Award of Master of Business and Administration Degree,Faculty of Commerce,Nairobi University.

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This management project is my original work and has not been presented for the award of a degree/diploma in any other University.

Signed _____

Onesmus Ayaya

This project has been submitted for examination with my approval as the University supervisor.

Signed _____

Mr. Tom Kongere.

Lecturer, Department of Management Science.

DEDICATION

To my mother,Rhodah O.Ayaya,Uncle Samson Masinde,my Cousin J.M.E Ambundo and my Brother J.A.Ayaya;they alone understand the plight of an aggressive young scholar.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

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ABSTRACT

This study is on pre-admission predictors of academic performance among cooperative management students.The study sought to investigate whether or not pre-admission attributes of cooperative management students can help to predict their academic performance in College.The main objective was to identify significant predictors of academic performance out of the student attributes selected,their relationship with academic performance and the predictive ability of derived model(s).The predictor variables selected for the study were :Marital status,academic achievements,general Knowledge,sex,number of years out of school,personality and interest in the programme.

The major primary source of my data were student records at the ministry of Cooperative.Data on 87 students was gathered and analysed using correlation and regression analysis.Another group of 85 students was used to validate the three models derived using Theil's inequality coefficient.The validation results confirmed the good predictive ability of the models.

The criterion variables used to derive the three models were:Overall academic performance,academic performance in accounting related courses and academic performance in non-accounting related courses.From the results of the analysis and model validation ,it was found that academic predictors for accounting related courses are fairly different from those for non accounting related courses.Only personality appeared significantly related with the two response variables.

Out of the seventeen predictive factors used in this study ,only years out of school, English language,personality,mathematics,science,and 'O' level aggregate were found significantly related with at least one of the criterion variables used.In situations where a particular variable was found significantly related with more than one criterion variable its relative importance varied.In the order of importance English Language ,personality, mathematics,and 'O'level aggregate were significantly related with performance in accounting.While years out of school,mathematics ,personality,and English language showed significant correlation with overall academic performance.On the other hand years out of school,science and personality were found important in predicting performance in non-accounting courses.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Sinte independence, the government of Kenya has been concerned with quality of education and training of high level manpower in order to meet the needs of various sectors of the economy. The importance of the quality of training and education to the government is reflected in the proportion of the government budget that has been allocated to the education sector, which rose from 10% in 1964/65 to 20% in 1985/86 (Kenya government, 1988: 20).The enhancement of the provision of all round education is one of the reasons cited by 1989-1993 Development Plan for the introduction of 8-4-4 system of formal education.Clearly,the ongoing major expansion of training facilities at the University level bears witness to this valuable course to which the government is committed.Hence, it is not surprising that the period since independence has witnessed an increase in the number of state owned Universities and colleges established to provide quality education that can enable the country meet manpower needs of its sectors.

One of the sectors,the sector of cooperative movement, has undergone tremendous changes .Some of the notable changes that have taken place include increase in the registered cooperative societies from 1030 in 1963 to 3944 in 1989,[1]establishment of

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1. Ministry of Cooperative Development, Annual Report,1989.

Cooperative bank and Cooperative Training Centre in Nairobi, and the establishment of the Cooperative College(Harambee Sacco,June,1987:2-3).With these changes in mind, it's the hope of the Government that the sector be prepared to handle credit provision to small farm holders and Marketing of agricultural outputs(Kenya Government,1986:86).One way to do so is through cooperative management training that is currently being offered at cooperative college of Kenya.

As a result of the increase in Cooperative societies and expected roles there has been the desire by the government to increase high level manpower through specialised training.Consequently,through the efforts of Nordic Governments (Sweden,Norway,Denmark,and Finland)and the Government of Kenya,Cooperative College of Kenya was established to train school leavers in accounting and general management in order to be able to man the challenges of the sector.However,the establishment of the College in 1972 has not guaranteed an increase in quality-trained personnel in the area of cooperative management.This is because not all admitted students in college may be able to perform to their and Government's expectations because a number of students withdraw from the College.The withdrawals could be voluntary following a variety of personal problems,or involuntary following such problems as failure to satisfy examiners.In situations where withdrawals are attributable to failure to satisfy the examiners,it is possible for examination administrators to lower the standards due to pressure from interested parties.Thus affecting the quality of

trained personnel unfavourably. Indeed ,over the years some students have had to leave following poor performance in examinations. In certain situations students have had to repeat classes in order to be able to meet at least the minimum pass requirements.Seemingly,for obvious reasons ,this kind of situation could lead to wastage of this land's resources in form of fees,student time and lecturers' time.

1.2 Statement of the problem

The academic performance has been the concern of many people such as the educationists ,government and parents ;this has been particularly true when students perform either below or above expectation(Daily Nation;March,19th,1990:7).Concern for academic performance in this country can be attributed to the fact that proccesion to the next stage in academic hierarchy depends on performance at the preceding stage.For instance,admission into institutions of higher learning,like Universities depend greatly on "A" level performance. The degree of the concern is yet to be fully felt after full implementation of 8-4-4 system of formal education.

To give a scientific solution to the issues pertaining to academic performance, institutions of higher learning like Universities have had to use committees of inquiry and /or research to investigate areas exhibiting poor performance.A case in mind is the committee appointed by the Senate to investigate high failure rate in the Faculty of commerce, Nairobi University. (Kohler,D., 1980). Several researches have been directed to this invaluable course by Hamilton and Freeman (1971),

Onuong'a (1988),Kapur(1972), Nisbet and Welsh (1966 and 1973), O'Halloran and Russell (1980), Spinks and HO (1984) ,Dunn and Hall (1984) ,Nderitu (1989) and Clark and Sweeney(1985). Most of these studies , however , are restricted at the University level,where entrants are considered to constitute academic top 'cream' of all high school graduates.Further,these studies indicate conflicting results with some studies indicating certain factors as having significant association with academic performance while others fail to find such association.Hence no consensus regarding which factors have significant association with academic performance has been found.Even in areas where research has been done there is a need for periodic review of student performance since predictor variables are subjected to change over time (William,1969).

A critical issue worth an inquiry arises, whether factors found to be predictors of performance at the University level are quite relevant in predicting student performance in cooperative management courses offered at cooperative college.Consequently, there is a need for a study to be carried out at Cooperative College.The entrants to this college are known to have been unfortunate following their relatively poor performance in "A" level examinations not to pursue studies in Kenyan four State-owned Universities immediately after graduating from high school.Another issue relates to the question of whether or not factors used to select students in management courses at cooperative college are quite relevant for predicting student performance.The objective of focusing on the issue of academic

performance at this management education level is to come up with key factors which could constitute selection criteria into Cooperative management courses and to provide guidance to students during their stay at the college.

With the present changes in education system,such as moving from 7-6-3 to 8-4-4 education system, increasing number of colleges and concept of cost sharing in education circles,there is a need to re-examine the key factors that could have impact on academic performance so that they could also be used in forming a selection criteria.The issue of cost sharing emerges together with question of selection criteria in situations where parents have to decide on whether or not their son/daughter could join a certain institution of higher learning where they are required to participate in financing of education after his/her admission.Such participation in financing is today inevitable given that it has been recognised by the government that costs of education are escalating fast to warrant such participation by parents (Daily nation,April 19th,1990:3).Moreover the study done by Muchira(1987) indicates that the mode of financing of student education affects his/her performance so long as only those able to pay fees in time can have adequate time for their studies.

Since the Cooperative College's inception, the Public Service Commission (P.S.C) has always received more applicants desiring to train in cooperative management than the training resources could allow.

Table 1.1:YEARLY APPLICANTS AND INTAKE (1985-1989)

YEAR	NO.Of applicants	Selected	Per centage
1985	960	30	3%
1986	769	30	4%
1987	816	30	3.7%
1988	611	30	5%
1989	535	30	5.6%

In the face of this multitude of interested applicants,the selection criteria could be considered to go beyond any simple minimum admission requirements.

The major criteria considered during the selection of students into Cooperative management programme are;

1.Two principal passes one of which must be in mathematics or economics at 'A' level.

2.At least Subsidiary passes in English language or Kiswahili or Literature in English.

3. Motivation, language fluency, interest and communication abilities as gauged during interview time.

As a result of the above admission criteria , students who enter in the diploma (cooperative management) course seem to be often of varying academic qualification.Given that interviews have to performed, it is possible for candidates to take some time after 'A'level before being admitted into the program. This may imply that students enrolled may posses different grades in 'A' level performance ,work experience and professional training in subjects like accounts and economics which may be related to cooperative management or not.

From the present selection criteria ,it is clear that the selection committee considers the Kenya Advanced Certificate of Education(K.A.C.E) level performance first before considering some of the candidates' attributes.The issue then arises as to whether or not the admission criteria are adequate.If so ,what should be the selection criteria with the 8-4-4 system of formal education? So far some of the studies in this area of academic performance indicate that the admission criteria are partly responsible for academic performance[Dr.Kohler report (1980),Onuong'a (1988)].With the present changes in our formal education in mind,it is now inevitable that the college has to come up with entry requirements for 8-4-4 system of formal education ,it is necessary to find out 'o'level student attributes that might have great bearing on student performance at the college.Presently ,the College has proposed C+ grade in mathematics as its key entry requirements.

The researcher having studied business management related courses has a strong reason to believe that other factors other than 'o' level mathematics which is emphasised in the proposed entry requirements (see appendix G) could have a bearing on student academic performance in Cooperative management related courses. It follows ,therefore, that a study which can find more about such factors could be worth pursuing in the conditions present under 8-4-4 system of formal education.

For purposes of coming up with an effective selection criteria,the enrollees' performance at the college has to be considered and evaluated. The criteria should be able to

distinguish those candidates that are going to succeed in the programme in a priori manner(Astin,1971).

Due to varying demographic factors, social and academic background of applicants for the programme as those given above,the following questions become apparent:

1 .Do social and demographic factors such as marital status, sex and age affect one's academic performance as a student at Cooperative College?

2 .Do factors interviewers rate such as applicant's personality,general knowledge and interest in the programme have any relevance in predicting student performance?.

3 .Do the actual grades obtained in K.A.C.E and K.C.E have any bearing on academic performance among Management students at Cooperative College?

4 .What should be the selection criteria on the understanding that 8-4-4 system will be in full operation at post high school level this calendar year (1990)?

1.3 Objectives of the study.

The purpose of the study is to investigate the relationship between academic performance and certain quantifiable pre-enrollment student attributes .That's:

1) To identify the selected predictive factors that could be useful in predicting academic performance in cooperative management courses.These factors are :sex,age,K.C.E and K.A.C.E results (academic achievements),marital status and number of years expired before joining Cooperative College.

2) To identify the nature of predictive regression

model that can be used to predict success of students at cooperative college.

1.4 Selection of predictor variables.

A problem worth noting in an empirical study using regression analysis relates to identification and selection of "best"or "suitable"set of predictor variables to be included in the model.This is a problem because there are three major uses of regression analysis ,namely:prediction,control,and description. For each of these uses, the investigator has to specify the set of predictor variables to be used since it's very unlikely that a study aimed to meet specific use can be used to satisfy other uses.This problem is worse when regression analysis is applied in social and behavioural sciences and management , where serviceable (useful) theoretical models are relatively rare (Neter and Wasserman,1974:371).Further,independent variables may not be directly measurable,yet the logical starting point for predictor variable selection would be to consider the cause and effect relationship with the dependent variable.This point has been aptly put by Green,P.E. and Tull,D.S (1978:p.70) in the following words:

" ... where possible we would like to know the causes of what we are predicting.Further,we would like to know the relationships of these causal factors to effects that we are predicting."[2]

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2. Green,P.E and Tull,D.S:Research for Marketing Decisions P.H.Inc.,Englewood Cliffs,New Jersey,1978,P.70

Similar contention is maintained by Horngren (1983) when he wrote that:

"...causality in a logical sense should be coupled with quantitative correlation,which uses formal statistical means to determine the extent to which a change in one factor was a accompanied by a change in another."[3] Although he supports Green,P.E et al (1978),he seems to advocate for the use of tests of goodness of fit and specification analysis suggested in statistical literature in order to buttress the intuition used to identify a reliable relationship between variables

On the other hand Kaplan(1982) emphasises the selection of predictor variables on the basis of their ability to increase the explanatory power of statistical analysis as measured by coefficient of determination, R^2. The following words have been used by him to explain his point:

"...Variables should be chosen on because the analyst has reason to believe they could be useful in explaining the variation of dependent variable."[4]The term 'believes' as used by Kaplan (1982) is a clear indication that subjective knowledge of the researcher can not be divorced from statistical analysis.

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3. Horngren,Charles:COST ACCOUNTING:Managerial emphasis,P.H.Inc.,New Delhi,1983,p.815.

4. Kaplan,Robert S.:Advanced Management Accounting,P.H.Inc.,New Delhi,1988,1982,P.105.

demographic factors such as sex and race; whose use in the country is legally unacceptable.

5. While it may be possible to consider cause and effect relationship in selection of predictor variables; it may not be economical to deal with many predictor variables in the developed model. This fact has been observed by Neter and Wasserman(1974:372) in the following words:

"A regression model with large number of independent variables is expensive to maintain."

Due to the above limitations, the choice of predictor variables is possible through serious consideration of their practical results, with large inputs from researcher's subjective judgment using the available predictor variables. Thus, it is possible to obtain 'better' results for the intended purpose without considering all predictor variables that have cause and effect relationship with the response variable because the presence of highly interrelated predictor variables may add little to the predictive power of the model. The need to screen and use fewer predictor variables is emphasized by Neter & Wesserman (1974:372) in the following words:

"Further, regression models with limited number of independent variables are easier to analyse and understand. ...the presence of many highly interrelated independent variables add little to the predictive power of the model, while detracting from its descriptive abilities and increasing the problem of round off errors."

Due to the above observation, the approach of selecting predictor variables as suggested by Green and Tull (1978) can be said to have limitations:

1. A causal relationship is usually quite difficult to comprehend and establish in a priori since this would call for accumulation of evidence over time from studies whose findings provide a pointer to the same conclusions to the extent of increasing the researcher's confidence that a causal relationship exists.However,it is never the case always for variables to have causal relationship over time. It is possible to have a certain predictor variable to indicate a causal relationship with response at a particular point in time or space but fail to indicate the same causal relationship later or at another place.Hence need for a continuous evaluation of those variables.

2. A given criterion variable can be caused by numerous factors; which may not be observed by the researcher at the time of investigation. For instance, social relationships of the student may affect his performance. Other variables such as student interest in the course or ambition may be relevant, yet unquantifiable for meaningful empirical study.

3. Many of the variables that the researcher may consider as having causal relationship may not be fundamental to the problem; or may be subjected to large measurement errors or may duplicate other variables in the list of selected variables.

4. Due to legal ramifications, there are certain predictor variables that may be found to have high relationship with the response variable, yet they cannot be used. A case in mind are

1. Administrators at cooperative colleges who could be interested in identifying early enough students bound to have unsatisfactory scores once admitted in the programme.

2. Prospective applicants to cooperative colleges could use the findings of this study useful in making their decision whether or not they should apply for admission into the programme.

3. The findings of the study should be valuable to the committee considering the criteria of admissions into cooperative related courses at Nairobi University and cooperative College .

4. The results of the study could be relevant to educationists and training officers who may consider restructuring the cooperative management courses at post high school level.

5. Academicians could use the findings of this study to conduct research in other institutions of higher learning offering different courses.

1.6 OVERVIEW OF THE PROJECT.

1).First chapter provides the introductory details,the objectives and importance of the study.

2).A synthesis of the literature relevant to the study is given in chapter 2. The review of this relevant literature is aimed at determining the critical factors considered over a period of time to be good predictors of academic performance in training institutions such as Universities and colleges.The background information about the college is also covered in this chapter.

3).Chapter 3 gives the research design to be used in the study.This encompasses the population of interest ,sampling plan ,Data collection and Data analysis methods.

4). Chapter 4 covers a statistical and theoretical background of multiple regression analysis ,a tool used for deriving meaningful information from the data collected.

5).Data analysis and research study findings are covered in chapter 5.The MLR MODEL is developed before validation exercise is executed.

6). Chapter six constitute the final chapter that provides a summary discussion of the findings and the conclusions derived therefrom.As usual , a study like this one has to face limitations which could form useful grounds for future research.These are also covered in chapter six.

CHAPTER 2

LITERATURE REVIEW

2.1 THE COOPERATIVE COLLEGE_

The Cooperative College of Kenya was started in 1972 after the premises housing the college had been constructed at Karen,Nairobi by Nordic governments.This was done under the agreement between Nordic governments and Kenya government.The college was established with the objective of serving as a national institution for cooperative training and education,where principles and technical skills for successful cooperative management are taught and disseminated.Since its inception, it has continued to play its role by offering a ground for cooperative seminars,certificates in cooperative management and administration, and Diploma in Cooperative management.

The term Diploma is a term commonly associated with two year post high school courses offered by most colleges in the republic of Kenya. In this country, the two year diploma course offered by different institutions tend to emphasise different areas of specialization. For instance, Diploma in Education. is offered in Kangumo, Siriba, Kisii and Kenya science teachers colleges.But Diploma in cooperative management is offered by Cooperative College at Karen. This course seem to be quite recent given that it was started in 1975 after the opening of the college at Karen in (1972).

Presently,the college has three academic departments offering a variety of courses,namely,Accounting,Law, and management.Over the years, no major expansion has occurred in

its capacity of 200 students;in fact its rarely used to full capacity.

The Diploma in cooperative management is pursued over a period of two years of continuous study.During the first year all students share common subjects.This is done so that enrollees obtain an adequate feel of cooperative management and to enable them select likely areas for specialization.The idea of specialization came into force in 1988,when the ministry desired to have specialized personnel in cooperative audits.Although there is specialisation,this does not rule out the fact that certain courses like cooperative management ,law,and practical field work are shared by all students.

The basic criteria for admission into the programme is at least one principal in either economics or mathematics together with subsidiary pass in either languages (Kiswahili and English),or geography and literature in English.At the same time the candidate must satisfy interviewers on matters relating to interest in program,communication and language fluency.

However, the degree of sternity/strictness of admission requirements has varied over the years with the present enrollees having nine points at 'A' level. The 'A' level (K.A.C.E) results are graded on the following basis:1 point for a subsidiary pass,2 points for principal E,... and 6 points for principal A, (the latter being the highest grade).Candidates are ranked during selection on the basis of total points awarded by interviewers on all relevant attributes of student.Thus the actual selection of pre-service Diploma in cooperative management is done by a

selection committee sitting at P.S.C.When points are awarded during the interview time the selection committee does not discriminate between subjects studied by the candidate/applicant; that is principal E in Mathematics has the same weight as Principal E in Economics.Similar non discriminative approach is used in the faculty of commerce,University of Nairobi,although no interviews are done in admission of students.

While in College ,a student is required to pass all the courses offered. A score of 50% or more is required for one to be awarded a pass.Supplementary examinations are offered to those who fail examinations done during the normal course period.A student can be discontinued depending on his/her performance in the supplementary examination papers.Any referral in any course (subject) leads to a student to qualify with an ordinary pass; in all other cases a student passes with either credit or distinction depending on whether she /he obtains a GPA of 60 -70% and 71%- 100% respectively during his or her stay at the college.

2.2 ACADEMIC PERFORMANCE PREDICTION

The concept of prediction has over the years received attention in many academic circles.For instance,predictive ability of accounting numbers has been researched on by academic 'heavy weights' such as Beaver(1968), and Altman (1968).It's not surprising that the prediction of academic performance has not been left behind. Extensive research has been executed in the West, especially in North America (Spinks and Ho,1984) in the recent past.However,very little has received publishers'

blessings in the published literature on the subject of - academic performance prediction in Sub- sahara Africa,except for a few studies done by Postgraduate diploma in Education students at Kenyatta University pertaining to Predictors of 'O' level performance , and those so far done by Onuong'a (1988) and Nderitu (1989) at Nairobi University.This kind of situation is not in itself a blessing to a nation like ours, which is emphasising the role of education in manpower training and development at post high school level.So far ,studies that have been published/done for diploma colleges established in this country are scant,except that done by Mbeche (1979).

Studies which have been done at the University level and 'O' level have been aimed at identifying factors that could be used to predict academic performance of students once they have been admitted in these institutions.For instance,at the University of New South Wales,O'Halloran and Russell(1980) used regression analysis to investigate the performance of first year undergraduate students.Their findings obtained through a series of regressional analyses revealed that there exists a significant relationship between high school performance and final mark obtained by the student in the first year.

An attempt by O'Halloran and Russell (1980) to carry out comparisons between their findings for two years led them to maintain that selection criteria based on previous trends may lead to unsuitable selection, particularly in situations where there exists changes in school certificate procedures and University courses such as those taking place in

Kenya.Consequently, it very likely to have a situation where relative importance of predictor variables they identified changing from year to year.

Williams (1969) contends that there is a need for periodic review of student performance since predictor variables can be subjected to change over time. This view was arrived at after he attempted to profile the common traits of successful certified public accountants (CPA) and those who were training to enter into the profession of CPA. The following constituted the variables he considered:Sex, age,number of examination sittings,education background, length and type of experience, scores on the A.I.C.P.A orientations and level II achievement tests,scholastic aptitude tests(SAT) and American college results (ACT).His findings revealed that the contribution of experience to good performance in CPA examinations was negligible.This led him to conclude that the desire of a student to seek experience before sitting for CPA examinations may lead to detrimental repercussions to the candidate's performance.

Conclusions similar to those of Williams(1969) were made by Dunn and Hall (1984) when they investigated the factors having significant association with CPA examination performance.Factors they considered included: School attended, hours of self study,completion of CPA review course,Scholastic aptitude test scores, age, completion of an audit course, work experience,accounting GPA and accounting hours completed. After carrying out statistical analysis they found little association between examination performance and candidates work ex-

perience,age, and completion of an audit course.

These researchers went further to caution their readers about their findings,for their findings of lack of significant association could be attributed to weak study tests that have inadequate power to detect association;and nature of data which could have precluded the identification of the true nature of relationship.(Dunn and Hall,1984:687).Further,they argued that none variation in age,years out of school and work experience may have over shadowed the actual relationship between these variables and examination performance.

The role of student environment on student's performance is emphasised by Mungai (1987) and Muchira (1987).Mungai (1987) found that qualified teachers and students' discipline do play a crucial role in secondary school performance (as measured by the number of student passes).His study was directed at unearthing problems leading to poor performance in national examinations (Kenya Certificate of Education).The researcher considered history of the school,its mode of financing, strikes, among other environmental factors.His findings seem to agree to what the Minister for education was quoted to have advised parents and teachers:

> "Good performance in national examinations is invariably linked with teachers' and pupils' discipline".
> (Daily Nation;Jan.21,1983:11).

In a survey of factors influencing performance in secondary

schools in Mukurweini division.Nyeri ;Muchira (1987) identified lack of adequate facilities,unqualified teachers,pupils per class, inefficient teachers ,low admission criteria,and fees payment as some key factors contributing to poor performance in K.C.E among secondary school pupils.

Onuong'a (1988) also strived to find the existence of a relationship between pre-entry student attributes of bachelor of commerce at the University of Nairobi on their final year academic performance at the university.The results of the study indicated a significant association between academic performance and Mathematics,age,Commerce related subjects,science subjects and 'O' level aggregate score.It follows therefore that his study supports view that demographics play a role in the prediction of academic performance.

The conclusion by Onuong'a(1988) that Secondary school results had an association with academic performance at the University level contrasts sharply with the findings of Hamilton and Freeman (1972). The two authors found the importance of 'A' level results to diminish with increased homogeneity in the group.In fact examination performance and personality variables were found to correlate closely.

A similar view was held by Mbeche (1979) when he recommended the use of creativity and interest , a factor that is also considered by PSC, in the selection of teacher trainee.He came up with such view when he investigated the relationship between teaching effectiveness and E.A.C.E aggregate,E.A.C.E maths,English,college performance,creativity ,attitude towards teaching,sex, and social

- economic background.

While using the grade obtained by the student in teaching practice as a measure of performance,he found out that the social background factors and creativity had significant relationship to teaching practice performance of the student teacher.In addition,female student teachers did better than their male counter parts.Contrary to findings by Onuong'a(1988) his study further revealed that E.A.C.E results didn't bear a significant relationship with teaching practice performance,hence not a significant predictor of teaching success.

Contrary to the above findings of Dunn and Hall (1984), Kapur(1972) found age,inter alia,to be related to academic performance.Other variables he considered in his study were:Scholastic, social,motivational,psychological variables and student experience at the University.This study by Kapur (1972) identified the significance of some predictors to vary by sex.In all his endeavours,he came up with a prediction scale based on multiple regression analysis which invariably constitute the thrust of this management project.He cautioned the readers about the applicability of his model for it could not provide a perfect classification due to unreliable examination criterion and nature of instruments of measurements(Questionnaires) he used;and failure to take into consideration all relevant variables affecting student performance, such as IQ and family environment.

The importance of demographic factors as predictors of academic performance is also emphasised in the study of Frakes (1977) carried out in U.S.He attempted to correlate introductory

accounting objectives and performance in intermediate accou
ing.Using both correlation and regression analysis on samples
equal size from Washington State University and University
Washington he concluded that a part from accounti
achievement test results, other variables,namely,sex,and age h
a high correlation with performance. Th the findi
of this study demonstrate that ,it is inadvisable to rest
oneself to previous academic achievements of the stud
only when admitting him/her into the academic program.

Nderitu (1989) considered the effects of entry le
characteristics on academic performance for M.B.A students at t
University of Nairobi.She found out that student work experien
can have detrimental impact on academic performance in M.B.
programme.Hence, she concluded that ,students wishing to enro
for M.B.A programme would best be advised to do so immediate
after completion of the first degree.This conclusion was arriv
at after considering other variables like marita
status,nationality and degree class;which had moderate impo
tance,and sex and sponsorship ;which were of very little impo
tance.

Another study on entry level factors was done by Spinks and
(1984).Using Multivariate analysis of academic achievement scor
as predictors of academic success over a five-year period,the
findings revealed that English language was the most importa
predictor of successful performance at the University of
Kong.This finding was attributed to the fact that Engl
language was the sole medium of communication at the Univ

sity.The achievement Scores in mathematics were found to add extra predictive power since they tend to be relatively independent of language ability of the student.Considering the cultural set up of China,this may seem to emphasise the contribution of cultural factors noted in the prediction academic performance.

Certain limitations can be observed from the above studies.One observable thing about the factors so far identified in the literature relate to the fact that no single factor can be used on its own to predict performance. The use of multivariate analyses in most studies demonstrates the fact that its only through the application of a combination of identified out level factors that one can be able to predict performance.This point is well emphasised by Nisbet and Welsh (1966) in the following words:

> "...variation in students' performance in the university is basically unpredictable from the evidence available at the time of entry."(p.472)

Such an observation implies that more attention should be directed to students' attributes after the first year results.In view of this fact ,performance prediction problem had to be investigated by Dockweiler and Willis (1984) from a different angle.The authors considered multiple factors as away of availing improvement on the long time honoured GPA (Grade Point Average).Their investigation concentrated on eleven variables pertaining to students enrolled at the Faculty of accounting ,Missouri-Columbia University.Through Stepwise regression

procedure and discriminant analysis,they identified the following three factors out of eleven as constituting better predictor of performance:

*Overall GPA earned prior to entering accounting programme.

*Grades in the first introductory accounting course.

*Grades obtained in the second introductory accounting course for local students.

Although age was found to more be significant than the first introductory course,they (authors) decided to gravitate to a three factor model for the purpose of transfer of students.th decision was based on legal ramifications of using age a criteria for transfer.

In spite of the fact that the three factor model achieved an over all correct classification of 71%; they had to caution readers about the difficulties that may result in attempt to develop a perfect model their advice is amplified well in th following words:

"any set of admission standards can be expected to result in some screening errors.That is ,some students who would have been successful would be screened out and others who are admitted subsequently will prove to be unsuccessful." (Dockweiler and Willis,1984:502).

In spite of the errors they referred to as indicated above,th three factor model was considered to be of superior performance over the one factor model in controlling the above two errors. which are commonly referred to by statisticians as type I and type II errors. Superior performance resulted from the fact that

the model was good at error minimization but not elimination.

Similar study was carried out by Clark and Sweeney (1985) in a attempt to develop a model that could be used to restrict admissions in accounting programmes.The model developed by the authors crystallized on three student attributes:

*GPA at 45 semester hours.

*Grade in English composition.

*Grade in college Mathematics.

The model developed by the authors achieved an over all correct classification of 90% of students who should not be allowed admission.Further,their three factor model was capable of identifying the same per centage of those students who performed exceedingly well in accounting.

Except for the study by Nderitu (1989) and Wright (1964) on graduate students,it can be noted from the literature available that research on postgraduate student performance has not been receiving the attention it requires.So far the postgraduate selection and admission is based on good first degree.This should be taken with care since a study done by wright (1964) on graduate students in U.S.A for eleven years indicated the fact that high grades obtained at the undergraduate level were less significantly related to the acquisition of a masters degree;while age and social adjustments were found to have inverse and direct relationship with performance respectively.

This precarious situation was attributed by the authors to heavy social responsibilities shouldered by older stu-

dents.Further observation was made on interviews that were carried out in assessing candidate's attitudes towards post graduate studies. According to the author interviews used failed to distinguish significantly between those who succeeded and those who did not.Hence,one could argue that selection interviews achieve very little, yet they are commonly applied in the selection of students admitted for diploma courses offered by cooperative college.

CONCLUDING REMARKS

The above literature review did explore a variety of factors that could be used to predict academic performance in so far as they affect it.Such factors include social friendships, GPA,sex ,age etc.Further,the studies so far carried out have concentrated more on secondary schools and Universities.Very little seem to have been done for Diploma colleges ,where admission is based on a host of factors.For instance,interviews are done to gauge student aptitude,interest,communication fluency and motivation.

Although a variety of factors have been noted in the literature as having significant relationship with performance,there seem to be no consensus regarding which factors have significant association with academic performance.This situation could safely be attributed to a variety of variables included in the prediction models by different researchers.It is likely for one variable to be significant in one study but not in the other due to varying time and place frame.Thus there is need to study factors contributing to successful academic performance at Cooperative college to shed more light on the area."More

important" variables should considered in the selection of students joining Cooperative college granted that a host of factors can affect student performance.For instance,Miller (1970) cites the following factors affecting academic performance:

*Social class,subculture,and family variables.

*Peer relationships,need for affiliation.

*The effect of extra-curricular activities and taking vacation or other part time employment.

*Ability,age and maturity.

*Psychiatric and other stress variables.

*Intrinsic interest in the subject studied.

*Persistence,Motivation,and other personality attributes,study habits and discipline.

*Reasons students themselves perceive as being instrumental in their failure.

Thus,the arguement by Miller (1970) and studies so far reviewed earlier emphasise the fact that ,a part from the past academic achievements of the candidate ,a host of other factors play a crucial role in academic performance prediction.

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CHAPTER 3

RESEARCH DESIGN

1.1: The population.

The population of interest consists of all students admitted at cooperative college between 1975/76 and 1987/88 academic years.Students who made voluntary withdrawal are excluded.The period was chosen mainly due to the fact that the cooperative management programme was started in 1975 and it possible to access student performance records up to 1989,when students who were admitted in 1987 graduated.This period is long enough for the researcher to be able to sufficiently sample the desired variables.One of the variables in this research which is used as a criterion variable include average mark (score)obtained in College examinations as computed at the end of the study period as grade point average(GPA).

However,performance in examination should be considered as a means to an end and not the end, since the college was established to train specialised manpower to man cooperative movement sector.It follows therefore,an appropriate measure of performance would have been subsequent performance after training at college and not performance in examinations.Since it's hard to reach students who passed through the college in order to be able to measure their performance in the field ,the college GPA in examinations was used as a criterion for performance ,hence concern for academic performance.

The criterion of academic performance was used in this

study because of conventional wisdom perpetrated in the previous studies reviewed.Further,employers in this country consider academic certificates in recruiting and selecting graduates for employment.This is clearly evident from job advertisements in the mass media .Lastly,higher educational opportunities are usually availed to students exhibiting higher scores in their examinations.For instance,admission into the University or Cooperative management programme requires the candidate to have higher/better grades at "A" level than other applicants for the same.

The population as defined above consist of research subjects who either performed poorly or well in the courses offered at the college.However,most of them must have performed well in their "A" and "o" levels since one of the entry requirements is that a student must have at least 2 principal passes at "A" level.This proposition is supported from records available at the college and from the fact that places available at cooperative college are fewer than the applicants to the extent that it's not adequate to attain the minimum entry requirements of two principals to be admitted (see table 1.1).

3.2:_Sample

A sample of 174 students was collected from the above mentioned population,although only 172 students were used due lack of certain information on other two students sampled for model validation.The decision as to the appropriateness of the sample size was determined on the basis of the following formula as suggested by Stevenson W.J (1978:208-209),and Owen and

Jones(1981:294-5):

$$n = z^2 \, s^2 / e^2$$

where:

n =Sample size

z= reliability factor

s=sample standard deviation

e= maximum tolerable or probable error.

The above formula is used to determine sample size when population standard deviation is unknown (Stevenson 1978:208).

For the purpose of study,the reliability factor is set at 95% confidence which suggests the value of z and alpha (α) is equivalent to 1.96 and .05. respectively. The sample standard deviation of 4.65 obtained by the researcher from a pilot study is used since population standard deviation is unknown to the researcher.In order to obtain the sample standard deviation,a random sample of 40 students from the list of students availed from the college was used to get GPA mean and standard deviation with the following results emanating from this pilot study:

$$\bar{X} = 65.531$$

s.d=4.65

In light of the recommendations by Daniel and Terrel (1983:123) and Stevenson W.J(1978:206),the above statistics should be considered as being unbiased estimators of population parameters since n is greater than 30.Consequently,the question of whether or not the population being sampled is normally distributed does not arise.

With a maximum tolerable error of .98 [which is obtained

by dividing reliability factor by 2 (Stevenson W.J,1978:206)],the sample size for the study is determined as below:

$$n=(1.96)^2\ (4.65)^2/(.980)^2$$

$$= 87.$$

The above sample size formula is utilised where population is infinite,but where sampling is done from a finite population the appropriate formula to use is :

$$n=\frac{(z^2S^2)N}{z^2S^2+e^2(N-1)}$$

where,

N=population size,which is 265 for this study

e= maximum tolerable error.

With z=1.96 , S=4.65, e=.98 and N=265;

then the sample size (n)

$$=\frac{(1.96)^2(4.65)^2\ 265}{(1.96)^2(4.65)^2+.98^2(264)}$$

$$=65$$

However the former sample size of 87 was used because it is a recognised fact in the statistical literature that as the sample size increases,the dispersion of the sampling distribution decrease,hence sample statistics could constitute good estimators of the population parameters.

This sample size was multiplied by two ,the total number of student groups desired,one for model development and another for model validation this was done in order to have equal number of students in sample used for model validation and

development.It is also done to avoid the problem of stationality since the sample is randomly drawn to identify those variables that might appear significant in a consistent manner.

Random sampling procedure using random numbers together with student registration numbers was used to select the subjects for model development and validation.For the purposes of model development and validation two groups of 'equal' size were used; as suggested above, one for model development and one for validation so as to be able to assess the predictive ability of the model identified.

3.3 Data collection

The study made use of secondary data relating to individual student's variables such as sex, marital status,age and GPA.These were obtained from records at cooperative college and the Ministry of Cooperative development.Details of the variables considered are given in the data collection form given on page 37.The criterion variable was obtained from the examination results list at college;while the data pertaining to student pre-admission attributes were obtained from the records at the Ministry headquarters.The term 'attributes' is used in this study because data on personality, interest and general knowledge were readily collected for use in this study from the Ministry records.

The "O" and "A" level scores as indicated on the data collection form were used as predictor variables .Although the thrust of this study pays regard to pre-admission attributes as academic performance predictors,other factors like social

relationships of the student and student background were excluded on the ground of immeasurability and lack of data.

To be able to measure performance,it was necessary to use long time honoured Grade points average (hereafter GPA) .This was computed from performance list given by College. Results of the interviews by PSC (Public Service Commission) were obtained from student personal files at the Ministry headquarters.

Relevant data for this study was not in usable form. It therefore became necessary to use codes as indicated in table 3.1 on pages 38 to 39 to transform data for the purpose of analysis. The "O" level results were used as given on the certificates.The performance per subject at "O" level is assessed through the award of points which fall between 1 and 9 as indicated below.

1- 2: Distinction pass

3- 6: Credit pass

7- 8: Ordinary pass

9 : fail

Thus the higher the points the poorer the performance at "O" level.Further, the aggregate score is computed before the award of a division to the candidate ,by considering the best six subjects out of all that are done by the individual.In the grading of "O" level the examination council considers an aggregate of six points as the best and 54 (six subjects times 9 points) points as the worst.Presently "O" level is graded using letters of the alphabet.These grades range from A to E,the latter being the worst.

Evaluation of "A" level performance under the old system o

education was based on principals A ,B ,C ,D, and E Which carry points 6,5,4,3 and 2 respectively.Also grade o and F are used,whereby grade 0 is commonly referred to as a subsidiary pass and it carries one point while F refers to FAIL(nil point score).

The maximum aggregate points for an individual depend on the subjects done which cannot exceed four principal subjects and one subsidiary.This suggests maximum aggregate of 25 points if general paper is considered as a compulsory subsidiary subject for all candidates.

The results for the two year diploma in cooperative management are given as a simple average obtained in the courses offered at the college.One is required to obtain an average score of at least 50% in in order to be awarded a pass.

For the period studied,all courses were compulsory to all students until 1988 when two options were introduced,namely;cooperative audit and cooperative management.Data on college examination performance was taken as given without making any transformations.

3.4: Data analysis

The major statistical tool used is the multiple regression and correlation analysis which can be used to identify factors that predict academic performance.statgraphic computer package on compaq computer in faculty of commerce was used to speed up the analysis.Further,the variables for analysis had to be code to provide quantifiable data.Tables and graphs were used where

appropriate to display information in a more coherent way.

Table 3.1 DATA COLLECTION FORM

K.A.C.E RESULTS

STUDENT FILE NO.	MARITAL STATUS	ENG. LIT.	ENG. LANG.	LUGHA KISWA.	ECONOMICS "A"	MATHS	AGE	SEX	TOTOL SCOR
1.									
.									
.									
.									
174									

K.C.E /E.A.C.E

STUDENT RE.NO.	SEX	MARITAL STATUS	COMMERCE "O"	MATHS	ENGLISH LANG.	SCIENCE AVERAGE	LUGHA
1.							
2.							
3.							
.							
.							
.							
174							

COLLEGE RESULTS

STUDENT NUMBER	FIRST YEAR (GPA)	SECOND YEAR (GPA)	OVERALL
1.			
2.			
.			
.			
.			
174			

Table 3.2 DATA CODES USED

VARIABLE	
========	
sex	: 1= male 2=female
English lang.	: Actual number/ results obtained
English Lit. "A"	: "
Mathematics 'A'	: "
Economics	: "
Age	: "
College GPA	: "
Commerce	: "
Maths. 'O'	: "
NO. of Years out of high school	: "
Marital Status	: Single=1 , Married= 2
Interest	: Points awarded by interviewers
Language fluency	: "

Communication Fluence :

Professional exams : CPA =2 ACNC =1

History 'a'

CRE 'a"

Average science 'o' As computed from the scores obtained in physics,biology or general science.

Average arts 'O' :

CHAPTER 4

THE STATISTICAL MODEL:A THEORETICAL FOUNDATION

4.0 INTRODUCTION

Multiple linear regression analysis(hereafter MLRA) is one of the many sophisticated statistical tools used to carry out multivariate analysis.Like in Discriminant analysis,it is applied where there exist one dependent variable and many independent variables.A combination of independent variables is utilised when more than one variable is required to explain a certain phenomenon.Unlike multiple discriminant analysis,the dependent and independent variables have to be continuous and be measured on ordinal or interval scale.

MLRA has been a common multivariate data analysis technique,particularly in area of prediction.As mentioned in the previous chapter,most studies done on academic performance prediction have utilized this tool to a larger degree.This chapter strives to expose ,in a coherent manner ,certain important theoretical attributes of MLRA as available in the research and statistical literature.

4.1 Aims of the technique

The key objectives of MLRA include:

i. To yield an equation that does describe in more mathematical terms the relationship underlying certain set of data since it may not be enough to know that a strong relationship exists between a dependent variable and a set of independent variables.(Boyd et al, 1988:569)

ii. To unearth the independent variables that contribute

consistently and significantly to variability of dependent variable.

iii. To determine in a more clear way a combination of independent variables that can be used to minimize the sum of squared deviations of observed values from regression surface.(Daniel and Terrel,1975:266).The methods of least squares and stepwise regression are used to achieve this objective.

4.2 Uses of MLRA

There are a number of ways the regression equation can be used. These are:

In situations where two variables measure approximately the same thing but one variable is relatively expensive or unattractive to work with,the ,the purpose of regression will be to estimate the value of unattractive variable on the basis of known values of the other.

Regression equations can be used to explain values of one variable in terms of another,in event of suspecting a cause and effect relationship between the variable.

Also regression equation can be used to predict future values of a variable such as employee or student performance.

In this study,multiple linear regression and correlation analysis are selected for use because the review of relevant literature on academic performance prediction tend to utilise it on a wider range. Since this study is in many aspects similar to those already studied,there is no reason to suppose that the technique is inappropriate.Also it is hoped that the technique is more capable of identifying significant performance predictors

and their relationship.Further, the technique lends itself on other statistical tests which can be used to enhance confidence in any predictive ability of the model developed in event of doubt.More over,the technique may well approximate the real situation without engaging in more rigorous and expensive non-linear models.Thus in situations where there is no priori reason for the researcher to expect non-linear relationship it is advisable to employ linear models like multiple regression analysis.

4.3 Nature of MLRA

The MLRA utilises two or more independent variables in a combination to predict the response variable.The purpose of using more variables is to improve the predictive ability of the regression model.Usually least squares technique is used to obtain the multiple line regression which takes on the following form:

$$Y=a+b_1x_1+b_2x_2+\ldots+b_kx_k$$

where:

Y= the dependent variable

a= the y inter cept or constant

k= the number of independent variables

b_i= partial regression coefficient for variable i

(Stevenson,1978:381).

Generally speaking, the number of continuous variables measured must be at least two or times less as the sample size(BOYD et al,1988:571).From the sample data collected on the measured

variables only one regression equation is developed.The regression coefficients are derived from the sample data so that the sum of squared deviations of the observed values from regression surface are minimised(Boyd and Terrel,1980:266).

4.4 Underlying assumptions

For validity of results of the regression model,MLRA has the following assumptions:

1. The deviation of the actual value of response variable (Y) from the true regression value (that's the error terms) are independent of each other.That's ,the deviation of one point from the regression value is unrelated to deviation of any other point.This assumption enables the standard errors of the multiple regression coefficients not to be seriously underestimated,sampling variances of the coefficients to be small, and predictions made by the regression equation to be less variable. Thus the assumption that the mean of error terms always equal to zero[E(u)=0].

2.The error terms for all sets of independent variables are assumed to be normally distributed. This assumption has been considered necessary for the purposes of making probability statements using standard error of the estimate (Horngren,1983:820).

3.For the results of regression to be valid ,the relationship among
the predictor variables must not be perfectly linear.That is ,none of the predictor variables should be an exact linear

combination of another predictor variable (s).This assumption is usually referred to as 'no multicollinearity' assumption(Horngren,1983:820) Which holds When the independent variables are not highly correlated to each other.

4. Additivity is also assumed. That is,the contribution of the individual predictor variable is additive to the contribution of other predictor variable in order to get overall effect on the response variable .This assumption is capable of assisting the researcher gauge the relative importance of the significant predictor variables.

5.The number of observations must exceed the number of regression coefficients (n+1),Where n is the number of predictor variables to be used in the regression model.

6.The variability of points in the population from the regression line is assumed constant.This is the assumption of constant variance which implies that the error terms and predictor variables are taken from the same population.Thus it is possible to have the size of the Independent variables not being able to affect the distribution of error terms.This implies that the covariance between a predictor variable and corresponding error term is zero.

7.The existence of a combination of Predictor variables is assumed to have a corresponding sub-population of Y values which are normally distributed.

8.From assumption 4 above ,the relationship between the independent variables and the dependent variable is assumed to be linear over the relevant range under consideration.This

assumption is necessary in ensuring that regression line derived from the sample data provides 'an accurate fit '.

It should be taken that the above assumptions are all necessary for the purposes of interpreting the 'goodness of fit 'of the regression equation derived from the sample data.

4.5 Procedure in Multiple Regression

1.Clarification of the nature of data to be used in model generation. This is undertaken so as to ensure that sample size is at least two times as large as the number of measured variables.

2.Specification of the mathematical equation.In most cases ,linear equations of the form:

$$Y=a + b_1x_1+b_2x_2+...+b_nx_n$$

are used.Where Y is the dependent variable and $X_1, X_2, ...X_n$ are independent variables.

All the b^1 denotes regression coefficients for independent variable.

3.Fitting the equation to observed data so that a regression line drawn through the plotted points results into the 'best possible fit'. The fitted equation should constitute a better predictor equation or lead to a better predictor line for the set of data.Indeed, this is the stage for model development where the relative importance of each predictor variable is determined.Presently, computer packages are useful to generate multiple regression coefficients.Such computer packages include statgraphic and spss.

4.Evaluation of regression equation.This step is undertaken to

enable the user of the model to know how good the model is;that's,how well the regression equation explains the variance of the dependent variable.This evaluation is done by computing coefficient of determination to measure how much variance is explained by the regression equation. More over certain statistical tests are available to evaluate if the assumptions of the model have been met.For instance, Durbin-watson statistic is used to test for the presence of autocorrelation or serial correlation.Also the t-test is usually used to test the significance of of regression coefficients and correlation coefficient,r.

5. Once the user is satisfied by the results of the above step,the model can be used for prediction.The resulting equation can be used if it has a significant fit with significant predictor variables.However,the forecasts or estimations obtained by using the model must be used with caution since the predictive model may be as good as the sample data used to derive it.Hence the old adage of "gabbage in ,gabbage out" (GIGO).

4.6 Drawbacks of using MLRA.

Whenever regression analysis is utilised, it is possible to face problems and difficulties which can lead to inaccurate results.The following are some of the problems identified in statistical literature (Boyd et al,1988:582):

1.The sample size used could be inadequate and unrepresentative of the population.Preferably the sample size should be large in order to be representative of the population and allow for

inferences to be drawn with confidence from the sample data.

2.The predictor variables measured during the study may have been poorly measured or may be in wrong form,or may not be the right ones.That's ,it is possible to use predictor variables that have no direct effect on the response variable.

3.The situation may be such that the predictor variables become highly correlated with each other.Where this situation of multi collinearity is great, it is possible for the effect of independent variables to be the same as that of a single independent variable.

4. Regression analysis assumes linearity;yet the true relationship between the dependent variable and independent variable(s) may not be linear,or its unusual form may not be approximated by regressional techniques.

CHAPTER FIVE

DATA ANALYSIS AND INTERPRETATION

5.1. Introduction.

This chapter is on data analysis ,interpretation and findings.Firstly,stepwise regression analysis is carried out to reduce the number of variables into a meaningful few.As mentioned elsewhere in this project ,the average score attained in all courses offered in cooperative management programme was used as a response variable.Because of introduction of two options ,namely,Cooperative audit and cooperative management,it became necessary to run other two stepwise regression using average scores obtained in accounting and non accounting related courses as criterion variables.The researcher was prompted to perform two stepwise regressions using GPA (accounting) and GPA (non accounting)because of the following reasons:

1.The entry requirements for cooperative audit majors at present seem to be fairly different from those for Cooperative management.The college puts emphasis on accounting related course such as principles of accounts,ACNC,and CPA I(k) done at an earlier stage as pre-entry requirement for candidates wishing to major in cooperative audit.

2.The researcher being a graduate of business,has a conviction that the success factors for accounting courses are different from those for non-accounting courses.

3.Further,the study done by Chirchir(1989) indicate that factors responsible for success in marketing option are quite different from those for accounting option at the Faculty

of Commerce ,University of Nairobi.

Predictor variables used in this study include those factors as indicated in the research design on the data collection form, table 3.1.Some of these factors are subjects offered at 'O' level.However ,some of these subjects under 7-6-3 formal system of education are no longer offered under 8-4-4 system.One dominant feature of the latter system is that so many subjects are taken by the candidate on one sitting and that the terms such as average score or grade are common in usage in discussing admission criteria for institutions of higher learning.It is necessary,therefore,to use average score/grade for each class of subjects taken by a candidate.The classification for subjects as used in this study is a modification of classification as used by the Ministry of Education as shown in the appendix B.Further, since one of the objectives of this study is to identify selection criteria on the basis of pre entry characteristics,it is imperative to use average score for each class of subjects taken by the candidate so that we come up with a group of subjects that can be used to select candidates into the programme instead of relying on a single subject.The need to have a group of subjects instead of one in the selection criteria is supported by the literature in this area of academic performance prediction which indicates that multiple factors are needed in explaining performance.Also the admission of 8-4-4 graduates into various courses offered at Kenyan's four public Universities is based on group of subjects.

As indicated earlier ,the 'O' level results used in this

study were graded on per subject basis using the following grading system:

1- 2	Distinction
3- 6	Credit pass
7- 8	ordinary pass
9	fail

Under the 8-4-4 system of formal education the grading structure utilises alphabetic letters and numeral points as indicated below:

Grade	Points
A	12
A-	11
B+	10
B	9
B-	8
C+	7
C	6
C-	5
D+	4
D	3
D-	2
E	1

From this kind of grading structure it is clear that the higher the points the better the performance for the student.This is quite different from the grading structure under the 7-6-3 system where low point score meant better performance.

Since Economics was never offered at 'O' level under the old

system,although it is currently offered under 8-4-4 system,it was necessary to use 'A'level Economics as a surrogate for 'O'level Economics(Onuong'a,1987:45).This was done solely in situations where the candidate never did 'O'level commerce and /or Principles of Accounts.Where the candidate did both 'O'level commerce and 'A'level Economics,the average of the two subjects was computed in order to come up with a yard stick for measuring performance in 'O' level Economics.

As discussed earlier,the examination results at 'A'level were graded on the basis of grades ranging from Principal A to E;grades which attracted points ranging from 6 to 2.For the purposes of gaining meaningful results out of this grading ,it was inevitable to use the following translation structure as suggested by Onuong'a(1988) in situations where 'A'level Economics was used as a surrogate for 'O'level Economics.

'A'level grade	'o'Level Equivalent
A	1.5
B	3
C	4
D	5
E	6
O	7.5
F	9

For the purposes of this study the following variables and their associated symbols are given on the next page:

Symbol	Variable
X1	General Knowledge
X2	Interest
X3	Personality
X4	Economics
X5	Maths'O'
X6	English Language
X7	Average Score in art subjects
X8	Average Score in Science Subjects
X9	Score in Other languages
X10	'O'Level Aggregate
X11	Division
X12	Years out of School
X13	Marital Status
X14	Sex
X15	Age
X16	Number of 'A'level points
X17	Number of 'A'level principals
Y1	Grade Point Average in all courses
Y2	Grade Point Average (Accounting)
Y3	Grade Point Average (Non-Accounting)

5.2 Stepwise Regression analysis of predictors on Y2

Instead of utilising Correlation analysis solely as away of selecting significant predictor Variables,stepwise regression was carried out using forward inclusion method.(See appendix E for details of the procedure).For the purpose of using stepwise regression analysis in predictor variable selection,a critical

BLE 5.2 (a): STEPWISE REGRESSION ANALYSIS OF PREDICT OR VARIABLES ON GPA (ACCOUNTING)

ELECTION: FORWARD — STEPWISE REGRESSION — CONTROL: AUTOMATIC
-TO-ENTER = 1.95 — MAX STEPS = 50 — F-TO-REMOVE = 1.95
STEP 4

-SQUARED = 0.35928
-SQUARED (ADJ.) = 0.328025 — MSE = 24.0462 WITH 82 D.F.

VARIABLES CURRENTLY IN MODEL

ARIABLE	COEFF.	F-REMOVE
3. x3	-.76320	7.8263
5. x5	-.75509	8.1230
6. x6	.86367	10.3708
10. x10	-.27310	7.7675

VARIABLES CURRENTLY NOT IN MODEL

VARIABLE	PARTIAL CORR.	F-ENTER
1. x1	.1297	1.3869
2. x2	-.0123	.0123
4. x4	-.0257	.0534
7. x7	-.0213	.0367
8. x8	-.0511	.2124
9. x9	.1480	1.8137

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	81.24618	4.288716	18.9442	.0000
x3	-0.763197	0.272808	-2.7976	.0064
x5	-0.755094	0.264937	-2.8501	.0055
x6	0.863672	0.26819	3.2204	.0018
x10	-0.273103	0.097991	-2.7870	.0065

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	1105.6685	4	276.4171	11.4952	.0000
ERROR	1971.7912	82	24.0462		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.35928
R-SQUARED (ADJ. FOR D.F.) = 0.328025
STND. ERROR OF EST. = 4.9037

F-value was set at 1.95(for alpha =.05 and df=10,87).Numerator degrees of freedom(df=10)of 10 were used because the maximum number of variables the package can accommodate during the input process is equivalent to ten.

To run stepwise regression analysis for the 17 variables .it was necessary to run it using the first ten predictor variables which were introduced into the package following the specification of the appropriate critical F-value.The results of this analysis are shown in table 5.2(a).

From this analysis it is clear that personality(X_3),Maths 'O' level(X_5),English language(X_6),and 'O'level aggregate(X_{10}) have a higher F-value than the critical F-value specified above.At this level of significance (α=0.05), the four factors constitute most significant predictors and they are able to explain .36 (adjusted.33) of the variability in the response variable GPA(accounting).To test for the significance of coefficient of determination, r^2, t-test was used.The t-value was calculated by the formula:

$$t = [r^2(n-2)/(1-r^2)]^{.5} = .36(85)/(1-.36)^{.5}$$

$$= 6.91.$$

Where n=sample size

The above computation was used to test the following hypothesis.

$H_o : r=0$

$H_a : r$ is not equal to zero.

Since the computed t-value of 6.91 was greater than the tabulated t-value,the null hypothesis was rejected to warrant the

TABLE 5.2(b): STEPWISE REGRESSION ANALYSIS OF PREDICT OR VARIABLES ON GPA (ACCOUNTING)

STEPWISE REGRESSION

SELECTION: FORWARD
F-TO-ENTER = 1.95
MAX STEPS = 50
CONTROL: AUTOMATIC
F-TO-REMOVE = 1.95
STEP 3

R-SQUARED = 0.105819
R-SQUARED (ADJ.) = 0.0734987
MSE = 33.1543 WITH 83 D.F.

VARIABLES CURRENTLY IN MODEL			VARIABLES CURRENTLY NOT IN MODEL		
VARIABLE	COEFF.	F-REMOVE	VARIABLE	PARTIAL CORR.	F-ENTER
1. x11	-2.35860	4.6047	3. x13	-.1456	1.7750
2. x12	1.06486	3.1285	4. x14	.1254	1.3108
7. x17	1.87193	3.2251	5. x15	-.0522	.2237
			6. x16	.0460	.1738

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	64.513766	3.369896	19.1441	.0000
x11	-2.358603	1.099144	-2.1459	.0347
x12	1.064859	0.60204	1.7688	.0805
x17	1.871929	1.042363	1.7959	.0760

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	325.65230	3	108.55077	3.27411	.02511
ERROR	2751.8074	83	33.1543		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.105819
R-SQUARED (ADJ. FOR D.F.) = 0.0734987
STND. ERROR OF EST. = 5.75798

TABLE 5.2(c): STEPWISE REGRESSION ANALYSIS OF PREDICT OR VARIABLES ON GPA (ACCOUNTING)

STEPWISE REGRESSION

SELECTION: FORWARD
F-TO-ENTER = 1.95
MAX STEPS = 50
CONTROL: AUTOMATIC
F-TO-REMOVE = 1.95

STEP 6

R-SQUARED = 0.395879
R-SQUARED (ADJ.) = 0.35057
MSE = 23.2395 WITH 80 D.F.

VARIABLES CURRENTLY IN MODEL

VARIABLE	COEFF.	F-REMOVE
2. x12	.84757	2.7653
3. x17	1.42383	2.6370
4. x3	-.69234	6.5602
5. x5	-.79202	9.1680
6. x6	.82326	9.6906
7. x10	-.25774	7.0469

VARIABLES CURRENTLY NOT IN MODEL

VARIABLE	PARTIAL CORR.	F-ENTER
1. x11	.0897	.6414

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	75.996218	4.893895	15.5288	.0000
x12	0.847572	0.50969	1.6629	.1000
x17	1.42383	0.876802	1.6239	.1081
x3	-0.69234	0.27031	-2.5613	.0122
x5	-0.792023	0.261577	-3.0279	.0033
x6	0.823255	0.264459	3.1130	.0025
x10	-0.257744	0.097094	-2.6546	.0095

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	1218.3019	6	203.0503	8.7373	.0000
ERROR	1859.1579	80	23.2395		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.395879
R-SQUARED (ADJ. FOR D.F.) = 0.35057
STND. ERROR OF EST. = 4.82073

conclusion that multiple correlation exists between the predictor variables and performance in accounting related courses.This conclusion is also supported by the fact that the five predictor variables have significant regression coefficients,granted that their respective computed T-values considerably exceed the tabulated t-value of 1.66.

The stepwise regression analysis of the first ten variables was followed by another stepwise regression analysis of the seven remaining predictor variables;that is Division,years out of school,marital status ,sex,age,number of principals,and number of 'A'level points.The same critical F-value was used as specified above.The results shown in table 5.2(b) indicate that the division obtained ,years out of school,and number of principals obtained at 'A'level have a higher F-value than the critical F-value of 1.95.The three predictors are significant and explain .11 (adjusted.073) of the variability in performance in accounting related courses.However this r^2 is significant at =.05,df=80.Due to this significance it was necessary to carry out another stepwise regression analysis using all predictors found significant in the above steps.Thus stepwise regression analysis was performed using years out of school,maths 'O' ,personality,English language,'O'level aggregate,division obtained,and number of principals at 'A'level.The results of this analysis are as given in table 5.2(c) and indicate that all the variables, except for division obtained, have a higher computed F-value than the critical F-value.All these significant predictors are able to explain .40 (adjusted .35) of variability.

TABLE 5.2(d): STEPWISE REGRESSION ANALYSIS OF PREDICTOR (i) VARIABLES ON GPA (ACCOUNTING)

STEPWISE REGRESSION .

SELECTION: FORWARD
F-TO-ENTER = 1.95
MAX STEPS = 50
CONTROL: AUTOMATIC
F-TO-REMOVE = 1.95

STEP 1

R-SQUARED = 0.0717579
R-SQUARED (ADJ.) = 0.0608374
MSE = 33.6074 WITH 85 D.F.

VARIABLES CURRENTLY IN MODEL

VARIABLE	COEFF.	F-REMOVE
2. x8	-.85154	6.5709

VARIABLES CURRENTLY NOT IN MODEL

VARIABLE	PARTIAL CORR.	F-ENTE
1. x11	-.1395	1.668
3. x2	-.0563	.267
4. x1	.0778	.511
5. x4	-.0892	.67
6. x9	.0805	.54
7. x7	-.0438	.161
8. x14	.1469	1.85
9. x13	-.0751	.47
10. x16	.1134	1.09

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	70.326842	1.998961	35.1817	.0000
x8	-0.851541	0.332194	-2.5634	.0121

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	220.83217	1	220.83217	6.57094	.01213
ERROR	2856.6276	85	33.6074		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.0717579
R-SQUARED (ADJ. FOR D.F.) = 0.0608374
STND. ERROR OF EST. = 5.79719

This coefficient of determination is significant at α=.05.Even after raising the critical F-value to 2.22 at α=.05,df=6,80;the six variables are still significant and they are able to explain .40(adjusted .35).This analysis suggests that division obtained at '0' level should be excluded from the model. The removal of of division obtained can be attributed to its significant correlation with maths'0'(x_5) and '0' level aggregate (x_{10}).

An attempt to run stepwise regression analysis using variables found insignificant in the earlier steps produced average score in science subjects (X_8) as the only significant predictor in the absence of the above significant six predictor variables.This predictor variable,average score in science, explains only .07(adjusted .06) of the variability in GPA accounting,which is significant at alpha =.05.

To show that the contribution of average score in science(X_8) is negligible, a multiple regression analysis was carried out with the earlier significant six factors together with X_8.The results of this analysis are given in table 5.2(d)and confirm that X_8 is insignificant at =.05 in the presence of the other six predictors variables found significant earlier,given its insignificant regression coefficient.Thus its presence in the model does not change r^2 =.4(adjusted.35).

Considering the correlation matrix given in table 5.2(e),there is evidence of multicollinearity given that significant correlation exists between 'O'level aggregate(x_{10}) and Maths 'O'(x_5) of .38,average score in science(x_8) and maths

TABLE 5.2(e): CORRELATION MATRIX FOR PREDICTOR VARIABLES

CORRELATION MATRIX

	x3	x12	x8
Y2	-.26467	.16443	-.26788
x17	-.11075	-.11123	.01697
x10	-.05622	-.08737	.39770
x5	.10744	.03781	.31224
x6	.00046	.05157	-.04488
x3	1.00000	-.03448	.09721
x12	-.03448	1.00000	-.15571
x8	.09721	-.15571	1.00000

CORRELATION MATRIX

	Y2	x17	x10	x5	x6
Y2	1.00000	.15146	-.33306	-.43217	.28824
x17	.15146	1.00000	.03740	-.01007	.02268
x10	-.33306*	.03740	1.00000	.37649	.09493
x5	-.43217*	-.01007	.37649*	1.00000	-.09092
x6	.28824*	.02268	.09493	-.09092	1.00000
x3	-.26467*	-.11075	-.05622	.10744	.00046
x12	.16443	-.11123	-.08737	.03781	.05157
x8	-.26788*	.01697	.39770*	.31224	-.04488

*Significant at $\alpha = 0.05$

TABLE 5.2(d)

ii) MULTIPLE REGRESSION ANALYSIS

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	76.11898	4.943669	15.3973	.0000
x8	-0.084449	0.314213	-.2688	.7888
x12	0.828083	0.517775	1.5993	.1134
x3	-0.684831	0.273323	-2.5056	.0141
x5	-0.779137	0.26744	-2.9133	.0046
x6	0.819002	0.266476	3.0735	.0028
x10	-0.24889	0.103068	-2.4148	.0179
x17	1.424824	0.881939	1.6156	.1099

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

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ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	1220.0003	7	174.2858	7.4126	.0000
ERROR	1857.4595	79	23.5121		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.396431
R-SQUARED (ADJ. FOR D.F.) = 0.34295
STND. ERROR OF EST. = 4.84893

TABLE 5.2(f): MULTIPLE REGRESSION ANALYSIS

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	75.996218	4.893895	15.5288	.0000
x17	1.42383	0.876802	1.6239	.1081
x12	0.847572	0.50969	1.6629	.1000
x3	-0.69234	0.27031	-2.5613	.0122
x5	-0.792023	0.261577	-3.0279	.0033
x6	0.823255	0.264459	3.1130	.0025
x10	-0.257744	0.097094	-2.6546	.0095

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	1218.3019	6	203.0503	8.7373	.0000
ERROR	1859.1579	80	23.2395		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.395879
R-SQUARED (ADJ. FOR D.F.) = 0.35057
STND. ERROR OF EST. = 4.82073

'O'(x_5) of .31 and 'O'level aggregate (x_{10}) and average score in science(x_8) of.40.The inter-relationships are positive.Positive correlation between maths'O' and 'O' level aggregate can be attributed to the fact that poor performance in 'O' level mathematics and science subjects leads to high points aggregate at 'O' level .Significant correlation between Maths'O' and average science can be argued to result from the fact that students who perform well in mathematics usually do well in science subjects.From table 5.2(e),it is clear that the correlation between average science and GPA (accounting) is less than that of maths'O' and/or 'O' level aggregate with GPA (Accounting),thus necessitating it removal from the group of significant variables. This therefore suggests that all other predictor variables not mentioned above were not significantly correlated with each other. but all the six predictor variables correlated significantly with academic performance GPA(accounting).This fact that all the six predictors are significantly correlated with performance in accounting related courses enhances our confidence in the selected predictors.

Due to the existence of insignificant correlation between x_{12} and GPA(accounting) [see table 5.2(e)]and between years out of school and performance in accounting related courses ,it was advisable to obtain multiple regression model fitting results in order to be able to test for the significance of regression coefficients for each predictor.The results of this analysis are given in table 5.2(f)and indicate that the standard errors of number of 'A'level principals (X_{17}) and number of years out of

TABLE 5.2(g): MULTIPLE REGRESSION ANALYSIS RESULTS

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROBABILITY
CONSTANT	81.24619	4.208716	18.9442	.0000
-3	-0.763137	0.272098	-2.7976	.0064
-5	-0.755094	0.264937	-2.8501	.0055
-10	-0.273103	0.097991	-2.7870	.0065
-6	0.863672	0.26919	3.2204	.0019

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB>F
MODEL	1105.6685	4	276.4171	11.4952	.0000
ERROR	1971.7912	82	24.0462		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.35928
R-SQUARED (ADJ. FOR D.F.) = 0.328025
STND. ERROR OF EST. = 4.9037

NUMBER OF RESIDUALS = 87
SAMPLE MEAN = 1.951958E-14
SAMPLE VARIANCE = 22.9279
SAMPLE STANDARD DEVIATION = 4.
COEFF. OF SKEWNESS = -0.
COEFF. OF KURTOSIS = 5.
DURBIN-WATSON STATISTIC = 1.

NUMBER OF RESIDUALS = 87
SAMPLE MEAN = 1.729677E-14
SAMPLE VARIANCE = 25.6996
SAMPLE STANDARD DEVIATION = 5.
COEFF. OF SKEWNESS = -0.837824 STANDARDIZED VALUE = -3.
COEFF. OF KURTOSIS = 5.33565 STANDARDIZED VALUE = 4.44691
DURBIN-WATSON STATISTIC = 2.09439

α = 0.05

Durbin-Watson tabulated upper bound = 1.60

Durbin - Watson tabulated lower bound = 1.41

TABLE 5.2(h) ; MOLTIPLE REGRESSION ANALYSIS - RESULTS

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	80.391164	4.45891	18.0339	.0000
x3	-0.872974	0.281426	-3.1020	.0026
x10	-0.384128	0.093694	-4.0998	.0001
x6	0.97031	0.275729	3.5191	.0007

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	910.34064	3	303.44688	11.62192	.00000
ERROR	2167.1191	83	26.1099		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.295809
R-SQUARED (ADJ. FOR D.F.) = 0.270356
STND. ERROR OF EST. = 5.10978

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	74.921748	3.784632	19.7963	.0000
x3	-0.681485	0.282069	-2.4160	.0179
x5	-1.048627	0.252819	-4.1477	.0001
x6	0.757628	0.276089	2.7442	.0074

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

INPUT [illegible]

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	910.09601	3	[illegible]	11.[illegible]	.[illegible]
ERROR	2150.5637	83	26.0069		
TOTAL (CORR.)	3077.4597	86			

R-SQUARED = 0.295787
R-SQUARED (ADJ. FOR D.F.) = [illegible]
STND. ERROR OF EST. = [illegible]

school (x_{12}) are greater than those for other variables taken individually.Considering the standard errors vis-a-vis the respective regression coefficients of the two predictor variables it is clear that these variables have considerably large standard errors which are reflected in low computed t-value of the respective regression coefficients which are less than the critical t-value of 1.66 at alpha =.05 and 80 degrees of freedom,hence it was advisable to delete the two predictor variables from the model.As shown in table 5.2(g)the removal of x_{17} and x_{12} from the model has little effect on R-Squared given that it has only changed from .40(adjusted .35) to.36 (adjusted .33) which is indeed a negligible reduction given that these variables were insignificantly correlated with performance in accounting related courses [see table 5.2(e)]. The removal of x_{12} and x_{17} suggests the following model :

$Y2=81.25-.76x_3-.755x_5-.275x_{10}+.864x_6$.

Although maths'O' (x_5) and 'O'level aggregate (x_{10}) correlate significantly, it was advisable to retain both of them since the removal of either materially leads to a drop in r^2 from .36 to .30 (see table 5.2(h))

5.3 Stepwise regression analysis of predictors on Y3

The process of predictor variable selection using stepwise regression analysis was also undertaken using the grade point average scored in non-accounting related subjects(Y3)as the response variable. For the purpose of this analysis ,the critical F-value at α=.05 and 10 and 87 degrees of freedom was specified to be 1.95 as it was for the previous analysis.

BLE 5.3(a) : REGRESSION ANALYSIS OF PREDICTORS ON GPA (NON-ACCOUNTING)

STEPWISE REGRESSION

SELECTION: FORWARD CONTROL: AUTOMATIC
F-TO-ENTER = 1.95 MAX STEPS = 50 F-TO-REMOVE = 1.95

STEP 3

R-SQUARED = 0.103959
R-SQUARED (ADJ.) = 0.0715719 MSE = 38.8396 WITH 83 D.F.

VARIABLES CURRENTLY IN MODEL			VARIABLES CURRENTLY NOT IN MODEL		
VARIABLE	COEFF.	F-REMOVE	VARIABLE	PARTIAL CORR.	F ENTER
1. x1	1.13683	2.0840	2. x2	.0947	.7420
3. x3	-.56993	2.7375	4. x4	.0479	.1884
8. x8	-.59105	2.5728	5. x5	-.1420	1.6881
			6. x6	.0963	.7674
			7. x7	-.0268	.0591
			9. x9	.0360	.1063
			10. x10	-.0486	.1945

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	72.729427	4.9756	14.6172	.0000
x1	1.136832	0.787488	1.4436	.1525
x3	-0.569933	0.344469	-1.6545	.1017
x8	-0.591049	0.368489	-1.6040	.1124

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	374.01345	3	124.67115	3.20989	.02718
ERROR	3223.6902	83	38.8396		
TOTAL (CORR.)	3597.7037	86			

R-SQUARED = 0.103959
R-SQUARED (ADJ. FOR D.F.) = 0.0715719
STND. ERROR OF EST. = 6.23215

This analysis was first done using the first ten predictors since the computer package could not accommodate all the seventeen predictors at once during the in put process.The results of stepwise regression of the first ten variables are given in table 5.3(a) .From these results it is clear that general knowledge(X_1),Personality(x_3),and average score in science(X_8) are significant predictor variables at α=.05 given that at this level of significance the three variables have a higher F-value than the critical F-value.It follows therefore that they are the only significant predictors prior to the introduction of the remaining seven predictors,and they explain .10(adjusted .07) of the variability in GPA (Non accounting). This r^2 is significant at =.05.Although this is significant at α=.05,it was necessary to test for the significance of the regression coefficient after performing multiple regression analysis .The results of this analysis are given in table 5.3(a) and indicate that only personality (x_3) has a significant regression coefficient,although the analysis of variance shows existence of a linear regression between the three predictors and performance in non accounting related courses,since computed F-value of 3.21 is greater than critical F-value of 2.73 at α=.05 and 3 and 83 degrees of freedom.

Due to the above findings ,it was necessary to carry out another stepwise regression analysis using the other remaining seven predictors;that is division,years out of school,marital status,sex,age,number of principals and number of points scored at 'A'level.The same critical F-value was used as specified

TABLE 5.3(b): STEPWISE REGRESSION ANALYSIS OF PREDICTORS ON GPA (NON-ACCOUNTING)

STEPWISE REGRESSION

SELECTION: FORWARD
F-TO-ENTER = 1.95
MAX STEPS = 50
STEP 2
CONTROL : AUTOMATIC
F-TO-REMOVE = 1.95

R-SQUARED = 0.095026
R-SQUARED (ADJ.) = 0.073479
MSE = 38.7599 WITH 84 D.F.

VARIABLES CURRENTLY IN MODEL

VARIABLE	COEFF.	F-REMOVE
2. x12	1.59232	6.0316
6. x16	.65857	2.2551

VARIABLES CURRENTLY NOT IN MODEL

VARIABLE	PARTIAL CORR.	F-ENTER
1. x11	-.0687	.3961
3. x13	-.0727	.4405
4. x14	.0123	.0127
5. x15	.0011	.0001
7. x17	.0393	.1284

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	58.085613	3.699117	15.7026	.0000
x12	1.592319	0.648356	2.4559	.0161
x16	0.658571	0.438554	1.5017	.1368

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	341.87546	2	170.93773	4.41017	.01509
ERROR	3255.8282	84	38.7599		
TOTAL (CORR.)	3597.7037	86			

R-SQUARED = 0.095026
R-SQUARED (ADJ. FOR D.F.) = 0.073479
STND. ERROR OF EST. = 6.22574

earlier.The results of this analysis are given in table 5.3(b). From this table, it is clear that in the absence of any other predictors,only .1 (adjusted .073)of the variability in performance in non-accounting related courses is accounted for by years out of school and number of 'A' level points. The two variables were significant predictor variables out of the list of seven variables analysed for they had a higher F-value than the specified critical F-value of 1.95.

The r^2 of .1 as afore mentioned is significant at =.05 and 83 degrees of freedom.However,the test for significance of regression coefficients revealed that only years out of school had a significant slope coefficient,although the analysis of variance results indicate the existence of a linear regression between GPA(non accounting) and the two predictors.This regression is significant at α=.05 and 2 and 84 degrees of freedom given that computed F-value of 4.41 is considerably greater than the critical F at that level of significance.

The above analysis was followed by another stepwise regression analysis using all predictor variables found significant under the above two stepwise regressions.Thus stepwise regression analysis was carried out using years out of school,number of 'A' level points,general knowledge,personality and average score in science subjects as predictors.Table 5.3(c) shows the results of this analysis which provide evidence to the effect that general knowledge and number of 'A' level points have a low F-value than the critical F-value of 1.95.This is not surprising since under the results of earlier analysis(see table 5.3(a) and table

TABLE 5.3(c): STEPWISE REGRESSION ANALYSIS ON PREDICTORS ON GPA (NON-ACCOUNTING)

STEPWISE REGRESSION

SELECTION: FORWARD CONTROL: AUTOMATIC
F-TO-ENTER = 1.95 MAX STEPS = 50 F-TO-REMOVE = 1.95
STEP 3

R-SQUARED = 0.134562
R-SQUARED (ADJ.) = 0.103281 MSE = 37.5131 WITH 83 D.F.

VARIABLES CURRENTLY IN MODEL			VARIABLES CURRENTLY NOT IN MODEL		
VARIABLE	COEFF.	F-REMOVE	VARIABLE	PARTIAL CORR.	F-ENTER
1. x3	-.56937	2.8300	3. x1	.1355	1.5342
2. x8	-.58877	2.7223	5. x16	.0974	.7858
4. x12	1.45420	5.0927			

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	73.280787	4.371603	16.7629	.0000
x3	-0.569374	0.338458	-1.6823	.0961
x8	-0.588773	0.356848	-1.6499	.1026
x12	1.454201	0.644394	2.2567	.0266

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	484.11245	3	161.37082	4.30171	.00716
ERROR	3113.5912	83	37.5131		
TOTAL (CORR.)	3597.7037	86			

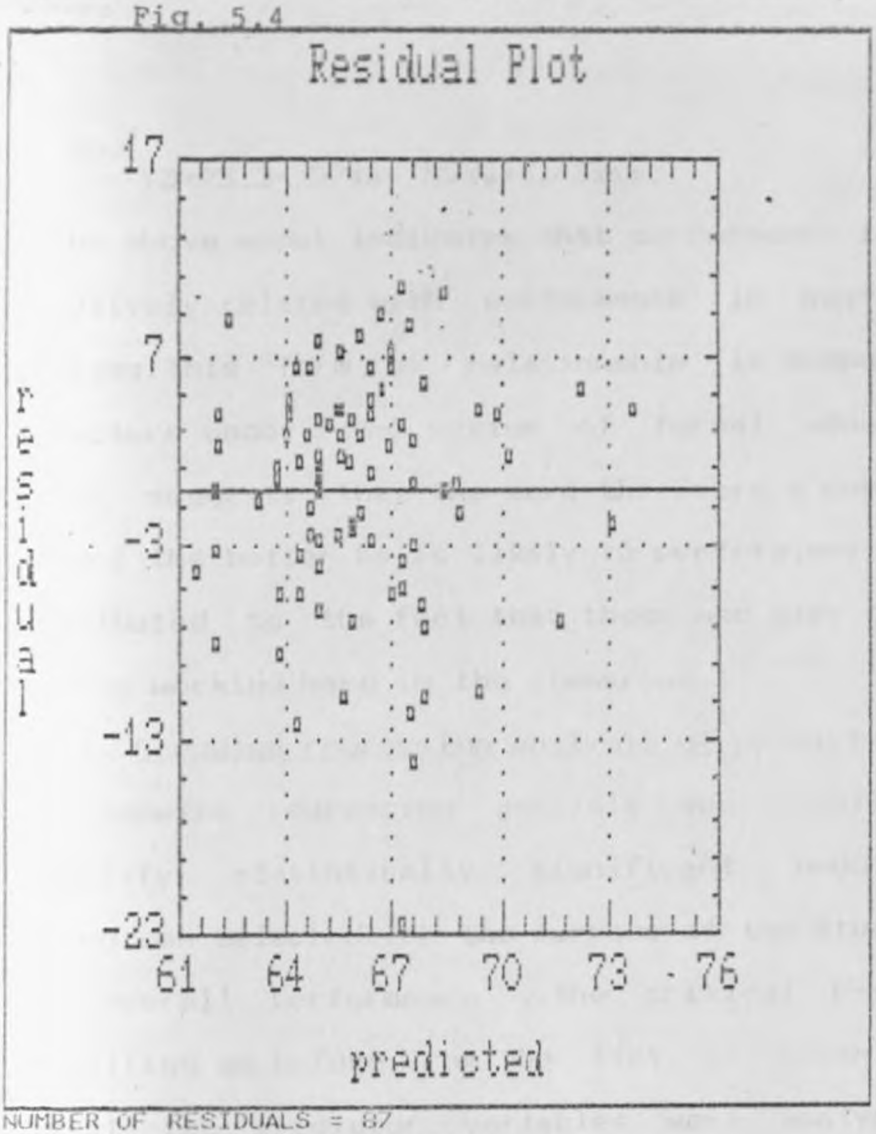
R-SQUARED = 0.134562
R-SQUARED (ADJ. FOR D.F.) = 0.103281
STND. ERROR OF EST. = 6.1248

5.3(b))there was evidence that the two predictors had low t-value,hence insignificant regression coefficient .On the other hand;personality,average score in sciences and number of years out of school are significant at alpha =.05 for they have a higher F-value than the specified critical F-value.The three account for.13 (adjusted .1)of the variability in performance in non-accounting courses.This coefficient of determination is significant at =.05.The three predictors are significant even after raising F-value to 2.72 at .05 level of significance and 3 and 83 degrees of freedom.

Regression coefficients for the three predictors variables were tested for their significance and results indicated that all the three predictors have significant regression coefficients at =.05,granted that standard errors for those regression coefficients were considerably lower than their respective regression coefficients.This fact was further supported by the results of analysis of variance which revealed that the computed F-value for the regression was greater than the tabulated F-value of 2.73 at α=.05,and 3 and 83 degrees of freedom.

Looking at the results of correlation analysis in table 5.3(d),there is evidence of significant correlation between each of the three predictors variables and performance in non accounting related courses,but there is insignificant correlation among the three predictors.This finding enhances the confidence in the model suggested by the analysis to be:

Fig. 5.4



NUMBER OF RESIDUALS = 87
SAMPLE AVERAGE = -1.58443E-14
SAMPLE VARIANCE = 36.2045
SAMPLE STANDARD DEVIATION = 6.01702
COEFF. OF SKEWNESS = -0.863035 STANDARDIZED VALUE = -3.28634
COEFF. OF KURTOSIS = 4.17155 STANDARDIZED VALUE = 2.23056
DURBIN-WATSON STATISTIC = 2.30758

5.3d: CORRELATION MATRIX FOR SIGNIFICANT PREDICTORS VARIABLES

	Y3	x3	x8	x12
Y3	1.00000	-.19733*	-.22441*	.26595*
x3	-.19733	1.00000	.09721	-.03448
x8	-.22441	.09721	1.00000	-.15571
x12	.26595	-.03448	-.15571	1.00000

*Significant at alpha = 0.05

Durbin - Watson tabulated Upper bound = 1.72
Durbin - Watson tabulated Lower bound = 1.57

$Y3=73.3-.57x_3-.59x_8+1.45x_{12}$.

The above model indicates that performance in sciences is negatively related with performance in non-accounting related courses.This form of relationship is supported by the grading structure under 7-6-3 system of formal education.However ,the model suggests that the more the years a candidate stays out of school the better he is likely to perform;may be, this could be attributed to the fact that those who stay out of school longer end up working hard in the classroom.

5.4 Stepwise regression analysis of predictors variables on Y1.

Stepwise regression analysis was finally carried out to identify statistically significant predictors,out of the seventeen selected for the purpose of the study ,when regressed on overall performance ,.The critical F-value of 1.95 was specified as before.From the list of seventeen predictors,the first ten predictor variables were analysed using stepwise regression analysis(with forward inclusion method).After specifying the inclusion method and critical F-value ,the regression was run.The results of this analysis are given in table 5.4(a).From the list of the first ten predictors out of the seventeen selected for the study,only general knowledge,personality,Maths'O',English Language and 'O'level aggregate were found to be significant at .05 level of significance.The five predictors account for .27(adjusted .22) of the variability in the GPA overall.This r^2 was found significant at .05 level of significance.However, this significant r^2 provides only a pointer towards a better model since it does not

BLE 5.4(a): REGRESSION ANALYSIS OF PREDICTOR VARIABLES ON GPA (OVERALL)

STEPWISE REGRESSION

SELECTION: FORWARD CONTROL: AUTOMATIC
F-TO-ENTER = 1.95 MAX STEPS = 50 F-TO-REMOVE = 1.95

STEP 5

R-SQUARED = 0.269753
R-SQUARED (ADJ.) = 0.224676 MSE = 29.0353 WITH 81 D.F.

VARIABLES CURRENTLY IN MODEL			VARIABLES CURRENTLY NOT IN MODEL		
VARIABLE	COEFF.	F-REMOVE	VARIABLE	PARTIAL CORR.	F-ENTEI
1. x1	1.10394	2.6505	2. x2	.1147	1.065
3. x3	-.75554	6.3152	4. x4	.0054	.002
5. x5	-.57743	3.8875	7. x7	-.0405	.131
6. x6	.73739	6.2556	8. x8	-.0549	.242
10. x10	-.20755	3.5682	9. x9	.1110	.998

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	76.455652	5.354259	14.2794	.0000
x1	1.103937	0.678075	1.6280	.1072
x3	-0.755537	0.30065	-2.5130	.0138
x5	-0.57743	0.292863	-1.9717	.0519
x6	0.737385	0.294822	2.5011	.0143
x10	-0.207552	0.109876	-1.8890	.0623

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	868.77398	5	173.75480	5.98427	.00009
ERROR	2351.8554	81	29.0353		
TOTAL (CORR.)	3220.6294	86			

R-SQUARED = 0.269753
R-SQUARED (ADJ. FOR D.F.) = 0.224676
STND. ERROR OF EST. = 5.38844

tell us more about the significance of the regression coefficients.Consequently,T-tests were performed to establish the significance of the regression coefficients.The results of this tests at α=.05 and 81 degrees of freedom revealed that only personality,maths 'o',English language, and 'o' level aggregate had significant significant regression coefficients.The insignificance of x_1,general knowledge as gauged by interviewers should be expected given that current affairs questions are used to measure it,yet certain candidates may not have the inclination towards current affairs.

Further,an attempt to establish the significance of the regression between the five predictors and GPA overall revealed that the data at hand provide evidence that support. ,at .05 level of significance ,the contention that there is a linear regression between the five predictors and GPA overall since the computed F-value is considerably larger than 2.34,the tabulated F-value for α=.05 and 5 and 81 degrees of freedom.

To find out which of the the other predictors not analysed above could be important predictors;another stepwise regression analysis was done at critical F-value of 1.95.The results of this analysis are as shown in table 5.4(b).As per these results ,there is evidence that from the list of seven predictors not analysed before,only the division obtained and the number of years out of school have a higher F-value than the specified F-value.The two variables account for .11 (adjusted .09)of

BLE 5.4(b): STEPWISE DEGRESSION ANALYSIS OF PREDICTOR VARIABLES ON GPA (OVERALL)

STEPWISE REGRESSION

SELECTION: FORWARD CONTROL: AUTOMATIC
F-TO-ENTER = 1.95 MAX STEPS = 50 F-TO-REMOVE = 1.95
STEP 2

R-SQUARED = 0.106485
R-SQUARED (ADJ.) = 0.0852108 MSE = 34.2581 WITH 84 D.F.

VARIABLES CURRENTLY IN MODEL			VARIABLES CURRENTLY NOT IN MODEL		
VARIABLE	COEFF.	F-REMOVE	VARIABLE	PARTIAL CORR.	F-ENTER
1. x11	-2.07219	3.4577	3. x13	-.1043	.9121
2. x12	1.55377	6.5270	4. x14	.0704	.413[illegible]
			5. x15	.0215	.038[illegible]
			6. x16	.1504	1.920[illegible]
			7. x17	.1452	1.787[illegible]

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	67.580004	2.603581	25.9566	.0000
x11	-2.072194	1.11439	-1.8595	.0664
x12	1.553772	0.608176	2.5548	.0124

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	342.94851	2	171.47426	5.00536	.00884
ERROR	2877.6809	84	34.2581		
TOTAL (CORR.)	3220.6294	86			

R-SQUARED = 0.106485
R-SQUARED (ADJ. FOR D.F.) = 0.0852108
STND. ERROR OF EST. = 5.85304

variability in GPA overall.Although the unadjusted r^2 is significant ,the adjusted one was not.Due to this significance of adjusted r^2,it was necessary to perform t-tests for significance of regression coefficients.The results of these tests revealed that the two predictors have significant regression coefficients.

This statistical evidence was supported by the results of analysis of variance,which showed that the data available provide evidence to support the contention that there is a linear regression between the two predictor variables and GPA overall;for computed F-value is considerably larger than the tabulated F-value for =.05 and 2 and 84 degrees of freedom.This is true when the first ten predictor variables analysed earlier are excluded from the analysis.

Encouraged by the above findings it was necessary to perform another stepwise regression analysis with the predictors found to be significant under the above regression runs.These predictors were : general knowledge,personality,maths'O',English language,'O' level aggregate,division obtained and years out of school.This further analytical step was undertaken in order to be able to gauge the most significant predictors when taken together since these predictors had been found significant under separate stepwise regression runs.The results of this analysis are given in table 5.4(c).From this table ,it is clear that,from the list of 7 predictors ,only personality,maths'O',English language,'O'level aggregate and number of years out of school have high F-value than the specified critical F-value of

TABLE 5.4(c): STEPWISE REGRESSION ANALYSIS OF PREDICTOR VARIABLES ON GPA (OVERALL)

STEPWISE REGRESSION

SELECTION: FORWARD
F-TO-ENTER = 1.95
MAX STEPS = 50
CONTROL: AUTOMATIC
F-TO-REMOVE = 1.95

STEP 5

R-SQUARED = 0.299745
R-SQUARED (ADJ.) = 0.256519
MSE = 27.8427 WITH 81 D.F.

VARIABLES CURRENTLY IN MODEL

VARIABLE	COEFF.	F-REMOVE
2. x3	-.75402	6.5791
3. x5	-.59173	4.2713
4. x6	.67072	5.3729
5. x10	-.21029	3.9162
7. x12	1.38367	6.2333

VARIABLES CURRENTLY NOT IN MODEL

VARIABLE	PARTIAL CORR.	F-ENTER
1. x1	.1529	1.9144
6. x11	.0129	.0134

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	77.600223	4.768037	16.2751	.0000
x3	-0.754019	0.293967	-2.5650	.0121
x5	-0.591726	0.286313	-2.0667	.0418
x6	0.670723	0.289362	2.3179	.0228
x10	-0.210285	0.106262	1.9789	.0510
x12	1.383672	0.554209	2.4967	.0144

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB(>F)
MODEL	965.36739	5	193.07348	6.93443	.00002
ERROR	2255.2620	81	27.8427		
TOTAL (CORR.)	3220.6294	86			

R-SQUARED = 0.299745
R-SQUARED (ADJ. FOR D.F.) = 0.256519
STND. ERROR OF EST. = 5.27662

1.95.The five predictors are significant and explain .3(adjusted .26) of the variability in the response variable (GPA overall)

The removal of general knowledge and division obtained should be expected since the former predictor variable was earlier found to have insignificant regression coefficient.However, the removal of division obtained could be attributed to its likely high correlation with 'O' level aggregate,Maths 'O' and English language.

In fact r^2 increased from .27 (adjusted.22) observed earlier when the analysis had been done without years out of school to .3 (adjusted .26).However,this does not give us all the information we need before deciding to include a certain predictor variable in the model.This being the case ,it was necessary to perform t-tests in order to be able to gauge the significance of the regression coefficient of each predictor variable.The results of these tests did provide evidence to support the contention that overall academic performance is linearly related to all the five predictor variables since T-value computed for each predictor was greater than the tabulated value of t,1.66,for =.05 and 81 degrees of freedom.

This evidence was further collaborated by the results of analysis of variance which did give a higher F-value than the critical F-value of 2.34 for =.05 and 5 and 81 degrees of freedom.Consequently,it was reasonable to conclude that the data available provide evidence to support,at =.05, the contention that there is a linear regression between overall academic performance in the courses offered at cooperative college and the

TABLE 5.4(d) CONDITIONS ANALYSIS RESULTS

CORRELATION MATRIX

	x3	x5	x6	x10	x12
x3	1.00000	.10744	.00046	-.05622	-.03448
x5	.10744	1.00000	-.09092	.37649	.03781
x6	.00046	-.09092	1.00000	.09493	.05157
x10	-.05622	.37649	.09493	1.00000	-.08737
x12	-.03448	.03781	.05157	-.08737	1.00000
Y1	-.26101	-.32601	.23123	-.26941	.26402

CORRELATION MATRIX

	Y1
x3	-.26101
x5	-.32601
x6	.23123
x10	-.26941
x12	.26402
Y1	1.00000

*Significant at alpha = 0.05

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROBABILITY
CONSTANT	77.600223	4.768037	16.2751	.0000
x3	-0.754019	0.293967	-2.5650	.0121
x12	1.383672	0.554209	2.4967	.0144
x5	-0.591726	0.286313	-2.0667	.0413
x6	0.670723	0.289362	2.3179	.0223
x10	-0.210285	0.106262	-1.9789	.0510

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB. (F)
MODEL	965.36739	5	193.07348	6.93443	.00002
ERROR	2255.2620	81	27.8427		
TOTAL (CORR.)	3220.6294	86			

R-SQUARED = 0.299745
R-SQUARED (ADJ. FOR D.F.) = 0.256519
STND. ERROR OF EST. = 5.27662

NUMBER OF RESIDUALS = 87
SAMPLE AVERAGE = -3.52005E-14
SAMPLE VARIANCE = 26.224
SAMPLE STANDARD DEVIATION = 5.12094
COEFF. OF SKEWNESS = -0.336572 STANDARDIZED VALUE = -1.28163
COEFF. OF KURTOSIS = 6.29112 STANDARDIZED VALUE = 6.2661
DURBIN-WATSON STATISTIC = 2.1439

Durbin-Watson tabulated Upper bound = 1.77
Durbin-Watson tabulated Lower bound = 1.52

TABLE 5.4(e) : MULTIPLE REGRESSION RESULTS

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	77.165165	4.857473	15.8859	.0000
X3	-0.842281	0.296593	-2.8399	.0056
X12	1.277695	0.562732	2.2705	.0257
X6	0.757625	0.291945	2.5951	.0111
X10	-0.299062	0.099113	-3.0174	.0024

ANALYSIS OF VARIANCE FOR THE FULL REGRESSION

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	PROB > F
MODEL	846.44329	4	211.61082	7.30865	.00004
ERROR	2374.1061	82	28.9535		
TOTAL (CORR.)	3220.6294	86			

R-SQUARED = 0.262813
R-SQUARED (ADJ. FOR D.F.) = 0.226859
STND. ERROR OF EST. = 5.38084

MODEL FITTING RESULTS

VARIABLE	COEFFICIENT	STND. ERROR	T-VALUE	PROB(>|T|)
CONSTANT	72.511343	4.085918	17.7466	.0000
X3	-0.688257	0.297231	-2.3156	.0230
X12	1.519549	0.559633	2.7153	.0080
X5	-0.820767	0.266493	-3.0799	.0028
X6	0.585132	0.291154	2.0097	.0476

0 CASES WITH MISSING VALUES WERE EXCLUDED.

RESIDUALS PLACED IN VARIABLE: RESIDUALS

Durbin-Watson tabulated Upper bound = 1.75
Durbin-Watson tabulated Lower bound = 1.55

NUMBER OF RESIDUALS = 87
SAMPLE AVERAGE = -3.55271E-14
SAMPLE VARIANCE = 27.4918
SAMPLE STANDARD DEVIATION = 5.24327
COEFF. OF SKEWNESS = -0.524036 STANDARDIZED VALUE = -1.99547
COEFF. OF KURTOSIS = 5.91067 STANDARDIZED VALUE = 5.54176
DURBIN-WATSON STATISTIC = 2.11181

NUMBER OF RESIDUALS = 87
SAMPLE AVERAGE = -3.4057E-14
SAMPLE VARIANCE = 27.6068
SAMPLE STANDARD DEVIATION = 5.25422
COEFF. OF SKEWNESS = -0.400037 STANDARDIZED VALUE = -1.5233
COEFF. OF KURTOSIS = 6.99507 STANDARDIZED VALUE = 7.6064
DURBIN-WATSON STATISTIC = 2.14479

5.4(d): MULTIPLE REGRESSION ANALYSIS RESULTS

five predictor variables.Thus a significant portion of the variation in GPA overall is explained by regression of GPA overall on predictor variables.

After establishing the existence of regression between the five predictors and GPA overall,it was necessary to establish the existence of the problem of multicollinearity among the five predictors.To do this,correlation analysis whose results are given in table 5.4(d) was performed with a view of unearthing this problem of multicollinearity .From this table there is evidence to support the view that there exists significant correlation between each of the predictors and the response variable.After carrying out t- tests of significance,for each coefficient in the matrix was further established that Maths'O' correlated significantly with 'O'level aggregate,none of the other predictor variables exhibited such correlation with each other,hence no severe problem of multicollinearity exists among predictor variables.The significant correlation between Maths'O' and 'O'level aggregate can be attributed to the fact that the score in Maths'O' tended to be included among the best six subjects before the award of a division.

Due to collinearity between Maths 'O' and 'O'level aggregate it was imperative to perform a multiple regression analysis without each of the two predictors in order to be able to gauge the effect of each on r^2.The results of these analysis are given in table 5.4(e).These results reveal that the only major effect of excluding X_{10} was to increase standard error of regression coefficient less than proportionately as the increase in the

TABLE 5.5:

CORRELATION MATRIX FOR ALL SELECTED PREDICTOR VAIRABLES

	Y1	Y2	Y3	x1	x2
Y1	1.00000	.80387	.80337	.18433	.10215
Y2	.80387*	1.00000	.67922	.13481	-.01420
Y3	.80337*	.67922*	1.00000	.20274	.11207
x1	.18433*	.13481	.20274*	1.00000	.06454
x2	.10215	-.01420	.11207	.06454	1.00000
x3	-.26101*	-.26467*	-.19733*	-.05064	.06665
x4	-.05954	-.11640	.03469	.06028	-.16815
x5	-.32601*	-.43217*	-.19407*	.02018	.06353
x6	.23123*	.29021*	.08922	.05093	.09204
x7	-.08830	.03112	-.06435	.00004	-.15221
x8	-.25556*	-.25738*	-.32441*	-.23116*	-.14725
x9	.05390	.05176	.02732	.06297	-.03209
x10	-.26341*	-.33906*	-.12699	-.17165*	-.02212
x11	-.19250*	-.21030*	-.08141	-.13756	-.04921
x12	.26402*	.16443	.26595*	.12927	-.06356

	Y1	Y2	Y3	x1	x2
x13	-.06097	-.06053	-.05289	.02187	-.19956
x15	.09311	.06926	.10986	-.10283	-.06927
x14	.09188	.13812	.05301	-.03668	-.16837
x16	.17798*	.17022*	.17333*	.14028	.01850
x17	.09294	.13146	.08519	.01582	-.07004

*Significant at alpha = 0.05

TABLE 5.5...Cont'd.

CORRELATION MATRIX

	x3	x4	x5	x6	x7
Y1	-.26101	.05954	-.32601	.23123	-.08330
Y2	-.26467	-.11640	.43217	.28824	-.09112
Y3	-.19733	.03469	-.19407	.00922	-.06435
x1	-.05064	.06028	.03018	-.05293	.03224
x2	.06665	-.16915	.06353	.00364	-.15221
x3	1.00000	-.00271	.10744	.00046	.07299
x4	-.00271	1.00000	.03661	-.07866	.09468
x5	.10744	.09661	1.00000	-.09092	.05273
x6	.00046	-.07866	-.09092	1.00000	.14711
x7	.07299	.09468	.06273	.14711	1.00000
x8	.09721	.11573	.31224*	-.04488	.16545*
x9	-.05432	-.06873	.14907	.22875*	.04990
x10	-.05622	.17561*	.37649*	.09493	.30331
x11	-.06390	.05027	.39474*	.11928	.30795*
x12	-.03448	-.03308	.03781	.05157	.10040
x13	-.00547	.21766	.01575	.00765	-.14467
x15	.13[illegible]	.01049	.00865	[illegible]	.01397
x14	.00[illegible]	.22297*	-.15468	.20109*	.19157
x16	.17245*	-.09339	-.15139	.02545	-.03689
x17	-.11075	.04440	.01007	.02268	.03699

*Significant at alpha = 0.05

value of the coefficient for number of years out of school(x^{12}),hence increase in computed t-value.However,no major change occurred in r^2.It can be argued that both predictor variables carry the information capable of explaining variability in GPA overall.Since 'O'level aggregate usually represents the performance in the best six subjects it likely to be correlated with subjects sat for by the candidate at 'O'level.It is advisable to remove it in the model although it contains useful information for selection.Its removal suggests the following model:

$$Y1=72.51+1.52x_{12}-.82x_5-.69x_3+.59x_6$$

5.5 DISCUSSION OF CORRELATION ANALYSIS RESULTS

This was performed after stepwise analysis in order to find out which variables are highly inter-related so as to be able to comment on the severity of multicollinearity problem in the available data;and demonstrate the likely reasons for predictor variable removal from and inclusion in the model which occurred during stepwise regression analysis stage. The results of correlation analysis are given Table 5.5 on page 84.From the correlation matrix in table 5.5 there is evidence of multicollinearity given that the following predictor variables are significantly correlated;particularly,Economics and 'O'level aggregate (.18),maths 'O' and science(.31),maths'O' and 'O' level aggregate(.38),maths 'O' and division (.40),English language and other languages (.23) ,art subjects and science (.19),art subjects and division (.31),art subjects and 'O' level aggregate(.30),Economics and marital status (.22),economics and

TABLE 5.5.....cont'd.

RELATION MATRIX

x8	x9	x10	x11	x12
-.25656	.05390	-.26941	-.19250	.26402
-.26788	.05176	-.33306	-.21030	.16443
-.22441	.02732	-.12699	-.08141	.26595
-.23116	.00297	-.17165	-.13756	.13927
-.14725	-.03808	-.02212	-.04921	-.06356
.09721	-.05432	-.05622	-.06390	-.03448
.11573	-.06873	.17561	.05027	-.03308
.31224	.14907	.37649	.39474	.02761
-.04488	.22875	.09493	.11928	.05157
.18545	.04990	.30331	.30795	.10040
1.00000	.09507	.39770	.30750	-.15571
.09507	1.00000	.35079	.14679	-.11857
.39770*	.35079*	1.00000	.76886	-.08737
.30750*	.14679	.76886*	1.00000	-.00273
-.15571	-.11857	-.08737	-.00273	1.00000

cont

-.0440	-.12094	-.08801	-.19444*	-.00606
-.1873*	-.05004	-.02588	.08710	.34461
.0128	.11377	.00018	.00186	.09864
-.23949*	.00016	-.14493	-.10013	.06699
.01687	-.04496	.03740	.07186	-.11123

*Significant at alpha = 0.05

TABLE 5.5....cont'd.

CORRELATION MATRIX

x13	x15	x14	x16	x17
-.06097	.09311	.09188	.17798	.09294
-.06053	.00926	.13812	.17022	.15146
-.05398	.10986	.05301	.17333	.08549
.02187	-.10283	-.03668	.16028	.04562
-.19956	-.06927	-.16837	.01830	-.07084
-.09547	-.13363	.06646	-.17245	-.11075
.21866	-.01049	.26207	-.09939	.04440
-.01575	.00865	-.15468	-.15139	-.01007
-.00865	.15876	.22108	-.03515	.02268
-.14425	-.01987	.13157	-.03689	.03689
-.04401	-.18735	.01281	-.23949	.01697
-.12094	-.05004	.11377	.00016	-.04496
-.08801	-.02588	.00018	-.14493	.03740
-.19444	.08710	.00186	-.10013	.07186
-.00606	.34461	.09864	.06699	-.11123

1.00000	.21774	.00414	.10459	.15969
.21774*	1.00000	.11361	.13330	.05814
.00414	.11361	1.00000	.10387	.01229
.10459	.13330	.10387	1.00000	.52911
.15969	.05814	.01229	.52911*	1.00000

*Significant at alpha = 0.05

sex (.26),English and sex (.22),science and age (-.19),science and number of 'A' level points (-.24),division and marital status (-.19),years out of school and age (.35),science and 'O' level aggregate (.40),division and science (.31),other languages and 'O' level aggregate (.35),'O'level aggregate and division (.77),marital status and age (.22),number of 'A' level points and number of principals(.53).

Another observable thing from the correlation matrix table is that most of predictor variables removed from the model through stepwise regression analysis do not significantly correlate with academic performance.

Marital status and sex are significantly correlated with Economics.This clearly shows that males who are unmarried tend to do better in this subject;even though the subject is insignificantly correlated with academic performance.This significant correlation with marital status and sex can be interpreted to mean that those who excel in Economics tend to be married male students .

Mathematics is significantly correlated with 'O' level aggregate ,science and division.This can be attributed to the fact that good performance in maths'O' leads to a better division .More over ,students do well in science subjects are bound to perform in maths'O'.English language is highly correlated with sex ,which indicated that males tend to do better in the subject.English language is also significantly correlated with other languages.This could be interpreted to mean that students who perform well in English subject tend to have high

interest to excel in other languages.Art subjects are significantly correlated with 'O' level aggregate and division. This should be expected given that art subjects are usually counted among the best six subjects before the award of a division.It is also clear that 'O'level aggregate correlate significantly with other subjects,namely.mathematics,art subjects,English language,Economics and science.

Science is significantly correlated with 'O' level aggregate , 'A' level points ,division and age.This correlation with age indicates that young candidates tend to do badly in science subjects.Further,those who perform well in science are usually bound to score better grades at 'A' level.This fact is clearly shown by the correlation between science and 'A' level scores.The correlation between division and 'O' level aggregate (.77) should be expected since a bad division results from high 'O' level aggregate. Although 'O'level aggregate score was highly correlated with other predictor variables it is significantly correlated with GPA (accounting) and GPA (overall). This clearly shows that its collinearity with other predictor variables does not over shadow it importance in selection of students for academic programmes.Thus it comes third after English language and Mathematics in the prediction of performance in accounting related courses.

The significant negative correlation between general knowledge (x_1) and science and 'O' level aggregate could be attributed to the fact that candidates who score highly in science courses at 'O' level tend to be poor at general knowledge matters as

indicated in current affairs questions;hence brains being subject specific.

CONCLUSION

The following conclusions can be made with regard to the analysis so far done:

A large number of predictor variables are correlated in a significant way.Those which were insignificantly correlated with academic performance were automatically removed through stepwise regression analysis.

*Different options require different emphasis on pre-entry requirements.

*Mathematics and English language are good predictors of academic performance,among all the 'O' level subjects analysed and it is followed by 'O' level aggregate.This is true for performance in all the subjects offered.

*Insignificant correlation exists among the selected predictor variables for each regression model derived.

5.6 IMPORTANCE OF PREDICTOR VARIABLES

The regression function coefficients as shown in table 5.6 can adequately be used to assess the relative importance of predictor variables and consider the likely method of weighting to be adopted.The absolute values of these regression coefficients could be taken to denote the relative contribution of respective predictor variable to the response variable.Thus it is assumed that the contribution of a predictor variable is measured by its absolute regression coefficient associated with the predictor

variable.

Below is the table indicating those variables that are most important to those that are not in predicting performance.

Table 5.6 Relative importance of predictor variables

a) GPA (accounting)

Variable	Coefficient	Per centage	Weighting
English	.864	33%	times 8
personality	-.76	29%	" 7
mathematics	-.755	28%	" 7
'o'aggregate	-.273	10%	times 3

b) GPA (Overall)

Variable	Coefficient	Per centage	weighting
Mathematics	-.82	23%	times 4
Personality	-.69	19%	" 4
English	.59	16%	times 3
years out	1.52	42%	" 8

C) GPA (Non Accounting)

Variable	Coefficient	Per centage	Weighting
Years out	1.45	55%	times 3
Science	-.59	23%	" 1
Personality	- .57	22%	" 1

5.7 VALIDATION

5.7.1 Introduction

. Validation is a necessary step in statistical analysis,particularly in situations where a model has been developed to be used for decision making purposes. It was therefore undertaken in order to find out whether or not the regression assumptions had been violated and assess the predictive ability/accuracy of the derived model.According to the available statistical literature,the validation of a model includes three basic steps,namely,rationalism,empiricism and prediction.Rationalism calls for the use of logic and theory underlying the model in order to ensure that the model is based on the existing body of knowledge.This step has been fairly covered during data analysis stage,particularly for correlation analysis.

On the other hand, empiricism utilises the test statistics such as multiple correlation coefficient,t statistics, F statistics and Durbin-Watson statistics.The first three of these statistics have been utilised to greater degree in the earlier stages of the analysis.To test for the presence of serial correlation among residuals,the latter test statistic was used.Since the computed Durbin-Watson statistic for all the three regression models derived were considerably greater than the relevant tabulated Durbin- Watson statistics ;it is suggested that the null hypothesis of independence of error terms be accepted .Consequently,it is concluded that the residuals are independent of each other.Thus from the results of t-test for

significance of correlation coefficient r ,analysis of variance and the above Durbin-watson test it can be argued that the models do meet the regression assumptions,and as a result they can be validated at the prediction stage to test their predictive accuracy.

The prediction step constitute the most formidable test of validity of the model derived.This is because we need to consistently be able to forecast student performance with the highest degree of accuracy through the use of the derived multiple regression model.

5.7:2 Validation

To perform the prediction test,one tests of goodness of fit was used;namely,theil's inequality coefficient.

For the purposes of validation of the model,a random sample of 85 students was taken from the population.Candidates' attributes constituting significant predictor variables of performance were entered into a well designed computer program as shown in appendix D so as to be able to predict candidate's performance given his/her attributes.The results are shown in appendix D.A computer program was written to compute Theil's inequality coefficient,U,so that the degree to which the derived models provides retrospective predictions,P_i of the observed value A_i(GPA)can be gauged adequately.The lowar this coefficient is the perfect the predictions.Thus when applying this test statistics,on the average a perfect model should give a low U so as to lead to the conclusion that predictions resulting from the model will be expected not to be quite different from the actual

GPA score.The results of model validation using U are given in appendix D. From this appendix the U value is low for GPA(overall) ,GPA (Accounting) and GPA(non Accounting,thus leading to the conclusion that;on the average predictions resulting from the three derived models are likely not to be considerably different from the actual performance.It can be said that the three models derived earlier provide good predictions although not perfect given that only less than fifty per cent of variability in academic performance was explained by the predictor variables found significant.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 : Conclusion

In the light of the results presented in the preceding chapter, certain conclusions become apparent. One notable conclusion is that out of the many pre-entry academic predictor factors considered in this study, only three factors indicated strong associations with academic performance among cooperative management students. This is because not only pre-entry academic achievements of the candidate have strong bearing on subsequent performance since personality attributes and number of years out of school before enrollment exhibited significant association with academic performance. The fact that number of years out of school and personality were found to have significant negative and positive correlation with performance respectively indicates the longer one stays out of school the better the performance, but performance becomes poorer when one scores highly on personality attributes,that is ,when one's appearance and expression are good

Looking at the pre-admission academic achievements, the following subjects failed to show significant association with performance although some of them are used in the present selection criteria. These are: other languages, art subjects, number of 'A' level points, Economics and number of 'A' level principals. All other pre-enrollment academic predictor factors indicated significant association with performance in cooperative management courses; particularly, 'O' level Mathematics(which

exhibited significant correlation with both overall performance and performance in accounting related courses) 'O' level aggregate and English Language.

But out of the non-academic predictor factors considered, only personality and number of years out of school showed significant association with performance in areas of students specialisation (cooperative audit and cooperative management). Predictor factors such as interest and general knowledge seem to be irrelevant in academic performance prediction.

It follows therefore, the results of this study provide an adequate indication that important pre-enrollment academic achievement predictor factors of performance in accounting related courses are fairly different from those which are important in the prediction of performance in non-accounting courses. Mathematics, English Language and 'O' level aggregate are key factors for the prediction of performance in accounting related courses. But science subjects constitute the only pre-enrollment academic score which is important predictor of performance in non-accounting related courses, although scores in non-academic factors such as personality and number of years out of school seem to play an important role in academic performance prediction.

For the purpose of predicting overall performance, the result of the study seem to provide emphasis on 'O' level mathematics and number of years out of school as the most important predictors(although not the only ones) of performance. This finding seems to be partially consistent with the present

proposal given by the college to students wishing to enroll for the programme.

The foregoing discussion leads to the suggestion that different factors such as 'O' level Mathematics, English Language and 'O' level aggregate should be emphasised in the selection criteria for the candidates wishing to enroll for cooperative audit. On the other hand, Science subjects, personality and number of years out of school should constitute predictor variables to be emphasised in the selection criteria for cooperative management majors, although personality appears significant under both options.

On validation of the three models derived, the models provided minimum error in the prediction since the Theil's inequality coefficient (U) values they led forth to were found insignificant to warrant the conclusion that small deviations are likely to exist between predicted and actual performance. Although the results of validation indicated relatively good predicative ability of the three models, the explanatory power as measured by r^2 was considerably low in absolute terms. Such low (r^2) provides a pointer to the fact that more important variables were not incorporated in the analysis. For instance the non-inclusion of variables such as student discipline, time spent on studying, cultural background, social affiliations while in college might have led to such low r^2. Alternatively, low r^2 could be attributed to inadequate validity in the statistical tools and tests applied on the data,although looking sophisticated. Thus it would be erroneous to emphasise only the

few selected predictor variables as the only suitable ones to be used in selection and guiding of students.

6.2 :Recommendations:

The foregoing conclusions drawn from this study's results lead to certain recommendations.

One clear thing is that the current admission criteria as is indicated in the appendix F seem to consider one of the important predictors, namely, personality, but the whole criteria is inadequate and there is need to improve on it, since the 'A' level scores emphasised were found insignificantly associated with performance. In choosing the direction of improvement on the selection criteria regard should be given to 'O' level aggregate. 'O' level Mathematics, and English Language in addition to other factors such as personality of the candidate and number of years out of school. This suggests that both academic and non-academic (years out of school and personality) should be considered.

Although staying out of school for long may lead to the candidate to engage in non-academic activities the results of this study indicate that this may provide a positive drive for the candidate to excel academically. Consequently, candidates inclined to join cooperative management programmes would well be advised to stay out of school for some time before enrolling for the programme.

6.3 Limitations of the study and direction for future research.

It would be total misdirection if the findings of this study are applied without paying adequate regard to the following limitations.

Although the study utilized several predictor factors (seventeen), it was not possible to come up with what could be termed as an exhaustive list of all possible predictor factors of academic performance. This was because it was difficult to collect and quantify certain predictor variables such as interest in various courses offered at the college, Social club membership and candidates cultural background.

Also, as mentioned else where in the project,the study did not unearth the causal relationship between the selected predictive factors and academic performance since the statistical tools used identified/revealed only associations between predictive factors and academic performance.

Further, the study focused on predictor variables on students who happened to have been the product of the 7-6-3 system of formal education. It is likely that some of the critical features of the old system were not carried over to the 8-4-4 system of formal education. For instance, the grading structure,subject matter content of courses offered and the number of subjects done on one sitting by the candidates to qualify for the award of KSCE certificate have changed under the 8-4-4 system of formal education. Such changes are bound to affect the predictive ability of the three models derived from

the data.

The current study utilised a population which excluded students who withdrew from the program on non-academic grounds, it is likely that certain information on these particular candidates was not incorporated in the analysis.

Lastly, considering the fact that statistical tools used in analysing and interpreting the data were at best able to indicate only statistical association, it follows that many of predictor variables found statistically insignificant might have resulted from the inadequate validity or/and power of the tools and tests to detect the associations required or as they existed. Alternatively, the nature of the data could have been inappropriate for unearthing the actual relationships.A combination of both factors can not be ruled out.

The above limitations suggests the following directions for future research.

The study paid no attention to post- admission factors that may have a bearing on academic performance. Factors such as time spent on self-study, discipline, cultural background, social membership,student teacher relationship and club membership could be included in future studies.

Regression and correlation analyses used in this study are not the only tools that could be applied on the data collected by the researcher. Other tools such as linear discriminant, factor and stepwise discriminant analysis could be used so that their results could be compared for consistency with the present results .The latter tool could be used in the variable selection

in future studies.

Once the 8-4-4 system of formal education is fully implemented it would be advisable for a similar study to be carried out with the data on the graduates of the system so that the results of such study could be compared with those of the current study.Also the effects of the on going cost sharing could be gauged in future studies.

Another study could be directed to all the students admitted including those who could have withdrawn due to non-academic reasons.

Further non parametric tests could be used together with data so far collected by the researcher to test whether or not some of the assumptions of regression analysis used in this study were met,since the results of this study could be as good as the assumptions of the tools used.

APPENDIX A

COURSES OFFERED AT COOPERATIVE COLLEGE.

1. FIRST YEAR COURSES:

Commercial accounts

Cooperative accounts

Statistics

Cooperative Philosophy and Structure of Co-ops

Economics

Personnel Management

Management Functions

Cooperative Law

Commercial Law

2. SECOND YEAR COURSES:

Costing

Auditing

Taxation

Field work project

Financial Management

Company Law

Cooperative Banking

Marketing

APPENDIX B

8-4-4 CURRICULUM FOR EXAMINATION :SUBJECT GROUPINGS

GROUP 1:

101 English Language

102 Kiswahili

111 History and Government

112 Geography

121 Mathematics

131 Biology

132 Physics

133 Chemistry

134 Physical Sciences

135 Biological Sciences

GROUP 2:

212 Christian Religious Education

213 Islamic Religious Education

214 Social Education and Ethics

215 Hindu Religious Education

GROUP THREE:

322 Home Science

323 Art and design

332 Agriculture

342 Woodwork

344 Metalwork

345 Building Construction

346 Power Mechanics

347 Electricity

348 Drawing and Design

APPENDIX B.....cont'd.

GROUP 4:

401 French

402 German

404 Arabic

405 Music

425 Accounting

426 Commerce

427 Economics

428 Type Writing with office practice

Kenya Certificate of Secondary Education (KCSE) will be awarded to all candidates who sit for at least 7 subjects selected from the four groups as follows:

i). 5 compulsory subjects from group 1:

- English Language
- Kiswahili
- History and Government
- Geography
- Mathematics

ii). Either Biology, Chemistry, and Physics

or

Physical Science and Biological Sciences

iii). One subject from Group two.

iv). Candidates taking physical science and Biological sciences MUST enter at least one subject from group 3 and at least one subject from group 4.

APPENDIX B.....cont'd.

MANAGEMENT PROJECT RESEARCH STUDY:

SUBJECT GROUPINGS

GROUP 1:Official Language

English Language

GROUP 2:Other Languages

Kiswahili

French

German

Arabic

GROUP 3:Business Education Subjects

Accounting

Commerce

Economics

GROUP 4:Practical and Technical Subjects

Home Science

Art and Design

Agriculture

Woodwork

Metalwork

Building Construction

Power Mechanics

Electricity

Music

Drawing and Design

Type writing and office practice

APPENDIX B.....cont'd.

GROUP 5: Science Subjects

Biology

Physics

Chemistry

Physical Sciences

General Science

Biological Sciences

GROUP 6:Mathematics

Mathematics

GROUP 7:Liberal art subjects

History

Geography

C.R.E

I.R.E

Social Education and Ethics

H.R.E

Literature in English

Fasihi ya kiswahili

APPENDIX C

TESTS, INTERIMS AND EXAMINATIONS

The procedure for interims and final examination is as follows:-

a) THE FIRST INTERIM COVERS THE MATERIALS TAUGHT FROM THE BEGINNING OF THE COURSE TO THE TIME OF FIRST INTERIM, AND ITS TOTAL MARK RESULTS ACCOUNT FOR 10% OF THE FINAL EXAMINATION PASSING MARK AT THE END OF THE COURSE.

b) THE SECOND INTERIM TO INCLUDE TESTING OF ALL MATERIALS TAUGHT FROM START OF COURSE TO THE TIME OF SECOND INTERIM, AND THAT ITS TOTAL RESULTS ACCOUNT FOR 30% OF THE FINAL PASSING MARKS AT THE END OF THE COURSE.

c) THE FINAL EXAMINATION INCLUDES EXAMINING OF ALL CONTENTS OF THE WHOLE COURSE FROM THE START TO THE END. SO THAT THE WEIGHT OF THE QUESTIONS IS DISTRIBUTED THROUGHOUT THE ENTIRE COURSE-WORK. THIS IS WHY ITS TOTAL RESULTS ACCOUNTS FOR 60% OF THE FINAL PASSING MARKS AT THE END OF THE COURSE.

COUNSELLING:

This function is a very necessary exercise. A subject lecturer might find it appropriate to talk personally to a student at any time within the duration of a student's course, and have a chance to relate a student's problems to some notes that he may have taken about performance in tests and interims. This is what is known as informal counselling. As a rule, however, it should be expected that students in need of such advice should receive at least a formal counselling not later than immediately after the second interim of their respective courses. A formal counselling is conducted by a counselling committee composed of the Director of Studies as Chairman, the Course Officer and the Subject Lecturer(s).

FINAL PASSING AND FAILING

(a) There is an Assessment Committee composed of the Director of Studies, Heads of Departments, Course Officers and any other appointed member of the Academic Senior Staff. Its main task is to ratify final passing or failing of graduands of the Co-operative College of Kenya. It acts upon interim examination marks, assessment reports, and any other relevant information obtained from such people as Course Officers. The Committee treats all subjects on the College Curriculum as major and in addition expects all Courses to have been taught Business Communication as a subject..

.../-

b) Unless otherwise stated by the Assessment Committee, the the passmark for an examination or interim test will remain 50% and above. However, where a big number of students fall below the 50% passmark in one subject but have attained 50% or above in all other subjects, the Assessment Committee should fix a lower passmark for the subject failed; the lower passmark could vary between 40% - 50% provided it does not fall below the computed average mark for that particular paper.

Therefore, for CBA, CFM, CCA(I.S.), and Diploma Courses, the passmark details are as follows:-

i) All subjects passed with 50% and above----- PASS

ii) Only one subject failed with 40% and above and a students average mark for all subjects is 50% and above ---------- PASS

iii) One subject failed below 40% but the average mark for all subjects is 50% and above ---------- REFERRED IN THE FAILED SUBJECT

iv) Two subjects failed with 40% and above, but the average of all subjects is 50% and above.---------- REFERRED IN THOSE TWO SUBJECTS FAILED

v) All other cases ---------- FAIL

c) PASSING AND FAILING IN SPECIAL CASES:

These apply to:

(1) Students who have not been able to attend lectures for a length of time due to sickness (confirmed by a letter from a recognized doctor from a recognised hospital) or due to any other such reasonable absence.

(2) Where a student sits for an examination while sick and the sickness has been ascertained as in (1) above.

In such cases the Assessment Committee will consider individual cases in terms of the whole examination, and, depending on the overall results obtained, the Committee may decide that the student passes (if results seem reasonable), or if otherwise, they may deem it fit to decide whether the student will be referred or fails.

d) REFERRED CASES:

Referred students in all the mentioned Courses will re-sit the interims or the final examinations in the subject failed. In order to qualify in those subjects the candidate will be required to score 60% and above. The following is the procedure for the timings of tests and examinations for referrals:-

(i) CBA & CFM - within the follwoing four weeks of the date of the interim failed, OR

- with either one of the two following final examinations after the one referred in, on a candidates own application.

(ii) CCA's and Diploma-within six months following the date the interim referred in was done, OR

-only with the next final examination following the final exam referred in, on a candidates own application to sit the referred paper(s).

e) REPEATERS:

(i) The College will allow students who have failed to repeat the whole examination on their own application to do so. However, a student will be allowed to repeat an examination only once. The passmark for the repeaters shall be 55% and above in all subjects. All repeaters must apply to be considered to re-sit the next due final examination of their Course.

(ii) FEES: The examination fees for repeaters will be as follows:-(subject to changes depending on circumstances)

1. CBA and CFM - K.Shs.40/- per subject to a maximum of K.Shs.220/-.

2. CCA and Diploma - K.Shs.60/- per subject to a maximum of K.Shs.400/-.

These rules are part of the main College Regulations and Rules. The rules become effective from July, 1985

By Order of the Co-operative College of Kenya's Authority.

APPENDIX D: COMPUTER VALIATION PROGRAM

```
10 REM MODEL VALIDATION PROGRAM
20 REM
30 REM
40 LET N=85
45 LET S2 A2 P2 0
50 LPRINT "MANAGEMENT RESEARCH PROJECT"
60 LPRINT "OBSERVED","PREDICTED","RESIDUAL","SQUARED","NUMBER"
70 LPRINT "=================================================================="
80 FOR S=1 TO 85
90 READ P,M,E,Y,G
100 REM         :R=residuals
110 REM         :Y=Years out of school
120 REM         :M=mathematics
130 REM         :E=English language
140 REM         :G=actual gpa obtained
150 REM         :Q=Predicted gpa
160 REM         :P=Personality
170 LET Q=72.51+(1.52*Y)-(.82*M)-(.69*P)+(.59*E)
180 LET R=G-Q        :REM R=Residual
190 LET S1 = R^2
195 REM S1=residual squared
200 LET S2=S1+S2   :REM S2=Sum of squared errors
210 LET P1=Q^2    :REM P1=Predicted value squared
220 LET P2=P2+P1   :REM P2=Sum of squared predicted values
230 LET A1=G^2     :REM A1=Actual GPA squared
240 LET A2=A2+A1   :REM A2=Sum of actual gpa squared
245 LET G1=G1+G
250 LPRINT G,Q,R,S1,S
255 LET S1=0
256 LET Q1=Q+Q1
257 LET R1=R+R1
260 NEXT S
270 LPRINT "-------------------------------------------------------------------"
280 LPRINT G1,Q1,R1,S2
290 LET Q2=(P2/N)^.5
300 LET A3=(A2/N)^.5
310 LET Y1=Q2+A3
320 LET Y2=(S2/N)^.5
330 LET U=Y2/Y1           :REM U=theil's inequality coefficient
340 LET Z=U^2*(83)
350 LET Z1=1-(U^2)
360 LET Z3=(Z/Z1)^.5
370 IF Z3=<1.66 THEN 390 ELSE 400
390 LPRINT "THEIL's inequality coefficient is significant",U
395 LPRINT "Value of sum of squared Predicted Values is ",[illegible]
397 LPRINT "Value of computed t value is ",[illegible]
400 LPRINT "THEIL's inequality coefficient is not significant",U
405 LPRINT "Value of Sum of Squared Actual GPA is",A2
410 DATA 14,[illegible],5,1,61.50,11,6,6,1,65.1,[illegible],11,8,[illegible]
420 DATA 11,5,5,2,[illegible],64.4,13,[illegible],14,8,[illegible],1,60,[illegible]
430 DATA 12,3,5,1,60.75,8,7,8,1,62.5,11,5,3,3,2,65,8,5,8,1,[illegible],10,[illegible]
440 DATA 9,8,[illegible],2,6,7,1,74,11,3,2,1,[illegible],11,7,6,1,74,10,[illegible]
450 DATA 9,7,[illegible],10,7,6,1,71,10,6,8,1,60.83,11,5,6,2,[illegible]
460 DATA 9,7,3,[illegible],11,6,7,1,62,15,6,7,1,67,10,9,6,2,[illegible]
470 DATA 11,[illegible],11,5,5,[illegible],1,71,10,6,4,[illegible]
480 DATA 11,[illegible],5,5,66,[illegible],8,[illegible],1,11,[illegible],2,68,12,8,[illegible],10,[illegible]
510 DATA 14,[illegible],13.5,6,7,[illegible],13,3,9,1,[illegible],10,[illegible]
520 DATA 11,5,5,1,61.5,14,3,7,1,61,10,[illegible],13,8,6,2,67.4,12,[illegible]
530 DATA 12,3,5,1,64.8,10,6,[illegible],11,[illegible],10,6,5,5,[illegible],11,[illegible]
540 DATA 14,3,8,2,68.3,10,3,[illegible],11,[illegible],12,2,8,2,69.5,11,[illegible]
550 DATA 14,9,8,2,[illegible],13,6,8,[illegible],68.3,10,[illegible],11,7,7,2,[illegible]
560 DATA 1[illegible],6,4,61.8,13,6,6,2,69.8[illegible],12,[illegible],3,70,11,7,9,2,[illegible]
570 DATA 12,8,4,1,64.9,10,6,[illegible]
575 DATA 7,4,[illegible],1,71.[illegible],8,4,6,4,60.3,10,[illegible],8,13,8,4,1,[illegible]
580 DATA 11,7,6,2,62,8.5,9,4,1,62.5,13,5,6,1,[illegible],9,3,8,1,[illegible]
```

APPENDIX D....cont'd.

MANAGEMENT OBSERVED	RESEARCH PROJECT PREDICTED	RESIDUAL	SQUARED	PERCENT
61.5	61.5011	-8.110046E-02		
1				
63.1	65.0611	-1.961098	3.845904	2
62.7	69.8361	-7.136097	50.92388	3
62.1	66.1211	-4.021103	16.16927	4
59	63.9111	-4.911099	24.11889	5
72.2	66.81111	5.388893	29.04017	6
64.4	63.73111	.6688958	.4474215	7
67.5	64.3711	3.129896	9.790854	8
60.3	61.9411	-1.641102	2.693215	9
68	65.8961	2.103905	4.426415	10
68.75	66.2411	2.508904	6.294597	11
68.3	67.4911	.8089066	.6543298	12
65	66.9261	-1.926094	3.709839	13
64	70.7711	-6.771103	45.84784	14
67	67.3811	-.3810959	.1452341	15
70	66.32111	3.678894	13.53426	16
74	67.0311	6.968903	48.56561	17
76	65.1611	10.83891	117.4819	18
74	64.2411	9.758904	95.2362	19
69	65.7511	3.248901	10.55536	20
78	65.0811	12.91891	166.8982	21
63	67.7311	-4.731102	22.38333	22
71	64.9311	6.068901	36.83156	23
60.83	66.9311	-6.101097	37.22339	24
63.5	67.4011	-3.9011	15.21858	25
64.83	66.1411	-1.311096	1.718973	26
66.17	66.8011	-.6311035	.3982917	27
62	65.6511	-3.6511	13.33053	28
67	62.8911	4.108898	16.88304	29
65	64.81111	.1888962	3.568177E-02	
30				
66	67.8511	-1.851097	3.426561	31
63.2	66.3411	-3.141094	9.866472	32
65	63.7661	1.233902	1.522514	33
71	66.6411	4.358902	19.00803	34
67	67.6111	-.6110993	.3734423	35
60	71.81111	-11.8111	139.5022	36
63	69.17111	-6.171105	38.08253	37
66	68.2911	-2.2911	5.249137	38
61	68.32111	-7.321106	53.59859	39
68	66.9411	1.058899	1.121267	40
65	63.66111	1.338894	1.792632	41
68	65.91111	2.088896	4.360663	42
63.9	62.64111	1.258896	1.584819	43
64	66.9661	-2.966103	8.797765	44
71.9	68.6511	3.248901	10.55536	45
63.2	67.9111	-4.711094	22.19441	46
60.6	67.1611	-6.561096	43.04798	47
61.5	65.7711	-4.2711	18.23284	48
61	66.6411	-5.6411	31.81269	49
59	68.2111	-9.211093	84.84432	50
67.4	66.73111	.6688958	.4474215	51
64.7	66.8711	-2.171101	4.714102	52
64.8	66.2411	-1.441094	2.076376	53
77.2	65.2011	11.69892	136.8642	54
64	60.5311	3.468899	12.03326	55
75.3	71.2411	4.058907	16.47472	56
63.4	61.71111	1.711104	2.928993	57
68.3	68.1511	.1487969	2.214207E-02	
58				
73	70.3211	2.678902	7.176514	59
			28.93247	60

APPENDIX D....cont'd.

77	71.62111	5.37889	[illegible]	
69.5	64.61111	4.888893	23.90128	61
76.47	68.7064	7.763901	60.27816	62
75.2	63.23111	11.96889	143.2544	63
68.3	66.38111	1.9189	3.682176	64
72	63.04111	8.958897	80.26183	65
73.3	66.35111	6.948899	48.28719	66
67.3	64.88111	2.418907	5.851112	67
61.8	66.47111	4.671108	21.81925	68
69.8	65.13111	4.6689	21.79862	69
70	[illegible]	.95609	.87622	70
70.8	65.46111	5.33889	11.14834	71
64.9	61.5511	3.3489	11.21513	72
67.95	63.9811	3.96889	15.75216	73
66.2	67.4911	1.2911	1.66693	74
53.6	64.5711	10.9711	120.365	75
71.3	70.0511	1.24889	1.559774	76
60.3	73.2511	12.9511	167.7	
66.8	[illegible]	[illegible]	[illegible]	
78				
69.2	60.0611	9.1389	83.5261	79
68.8	[illegible]	[illegible]	[illegible]	80
[illegible]	[illegible]	3.76111	14.14588	81
[illegible]	[illegible]	.6461	.41	82
67.7	64.5011	3.19889	10.23	83
71.6	70.0811	1.51889	2.30704	84
72.6	65.0611	7.53889	56.8348	85
5682.14	5630.654	51.5065	2444.141	

THEIL's Inequality Coefficient (Unconditional) [illegible]
Value of Sum of Squared Predicted Values [illegible]
Value of Computed [illegible] Value's [illegible]
THEIL's Inequality Coefficient (Conditional) [illegible]
Value of Sum of Squared Actual GPA [illegible]

```
10 REM MODEL VALIDATION PROGRAM
20 REM
30 REM ================================
40 LET  N=85
45 LET S2=A2=P2=0
50 LPRINT "MANAGEMENT RESEARCH PROJECT"
60 LPRINT "OBSERVED","PREDICTED","RESIDUAL","SQUARED","NUMBER"
70 LPRINT "=============================================================="
80 FOR S=1 TO 85
90 READ P,M,E,Z4,G
100 REM       :R=residual's
105 REM Z4=aggregate obtained at "O" level
110 REM       :Y=Years out of school
120 REM       :M=mathematics
130 REM       :E=English language
140 REM       :G=actual gpa obtained
150 REM       :Q=Predicted gpa
160 REM       :P=Personality
170 LET Q=81.25-(.76*P)-(.755*M)-(.273*Z4)+(.864*E)
180 LET R=G-Q       :REM R=Residual
190 LET S1 = R^2
195 REM S1=residual squared
200 LET S2=S1+S2    :REM S2=Sum of squared errors
210 LET P1=Q^2      :REM P1=Predicted value squared
220 LET P2=P2+P1    :REM P2=Sum of squared predicted values
230 LET A1=G^2      :REM A1=Actual GPA squared
240 LET A2=A2+A1    :REM A2=Sum of actual gpa squared
245 LET   G1=G1+G
250 PRINT G,Q,R,S1,S
255 LET S1=0
256 LET   Q1=Q+Q1
257 LET   R1=R1+R
260 NEXT S
270 LPRINT "--------------------------------------------------------------"
280 LPRINT G1,Q1,R1,S2
290 LET Q2=(P2/N)^.5
300 LET A3=(A2/N)^.5
310 LET Y1=Q2+A3
320 LET Y2=(S2/N)^.5
330 LET U=Y2/Y1          :REM U=Theil's inequality Coefficient
340 LET Z=U^2*(83)
350 LET Z1=1-(U^2)
360 LET Z3=(Z/Z1)^.5
370 IF Z3=<1.66 THEN 390
380 GOTO 392
390 LPRINT "THEIL's inequality Coefficient Insignificant",U
392 LPRINT "THEIL'S inequality coefficient is Significant is",U
395 LPRINT "Value of Squared SUM of predicted values is",P2
396 LPRINT "Value of SUM of squared  actual GPA is",A2
397 LPRINT "value Of Computed T-value is",Z3
400 DATA 14,7,5,33,63.7,11,6,6,34,60.833,8.5,3.7,24,60.33,11,8,8,41,61
410 DATA 13,8,6,25,79,9,7,7,31,64.7,10,7,6,31,70.33,10,6,8,27,59.1
415 DATA 11,5,6,23,66.5,12,6.9,32,65.5,9.7,8,31,61.43
420 DATA 13,5,5,29,59,11,5.5,21,71.83,9,9,3,27,67.7,13,3,3,23,70.5,11.8,7,30,7
430 DATA 9,3,8,31,70.5,11,6,6,27,70.5,12,3,5,27,67,8,7,8,28,61.6,11.5,3,3,15,6
435 DATA 11,6,7,34,60.7,11,7,25,73.167,10,6,8,32,58,13,8,4,20,73.67
440 DATA 12.5,3,5,25,71,11,7,6,28,65,8.5,9,4,28,62.33,13,5,6,26,67.33
445 DATA 10,9,3,28,65,10.6,5,23,72,11,9,7,34,60.9,14,3,8,27,68.7,10,3,7,7,75
450 DATA 11,5,8,27,76.7,12,9,8,33,70,11.5,7,9,36,73.6,14,9,8,30,74,13,6,8,31,6
470 DATA 10,5,7,35,60.33,11,5,5,22,63.5,14,3,7,30,63.5,10,3,6,20,62.67
480 DATA 15,6,7,29,66.7,10,9,6,27,62.3,9,5,7,22,65.67,11,3,4,24,62.2
490 DATA 11.5,5,3,20,65.3,7,6,4,26,71.2,10,6,4,20,65.8,3,4,6,35,61,11.5,9,20,5
500 DATA 9,9,3,22,63.5,9.7,8,26,61.8,11,7,8,30,68.7,12,8,5,27,63.7,10,9,8,31,7
510 DATA 9,6,7,30,70.7,11,3.2,16,81,11,7,6,36,66.3,10,6,6,25,68.67
520 DATA 14,9,7,35,62.3,12.5,6,7,18,66.67,9,3,3,17,74.3,13,3,9,22,65.8
550 DATA 10,9,3,29,63.7,11,7,7,29,77,15,8,8,27,65.43,12,9,6,32,61.30
```

APPENDIX D....cont'd.

```
560 DATA 12.5,2,7,20,?,43,11,7,9,33,68.6,12,8,4,25,51.25,10,6,3,21,66
570 DATA 9,4,5,17,65.9,9,9,7,31,54.6
580 DATA 8,4,6,26,58.5,10,6,8,25,63,15,8,4,20,73.67,10,3,3,28,65.2
582 DATA 9,4,4,17,65.9,9,9,7,31,54.6
585 DATA 8,3,8,27,62.7,10,7,5,25,66.33,9,8,6,38,66.33,7,4,7,25,73.2
MANAGEMENT RESEARCH PROJECT
```

OBSERVED	PREDICTED	RESIDUAL	SQUARED	NUMBER
5665.001	5647.042	17.95894	2682.351	

```
THEIL's inequality Coeficient Insignificant                4.212524E-02
THEIL'S inequality coefficient is Significant is           4.212524E-02
Value of Squared SUM of predicted values is                375982.1
Value of SUM of squared  actual GPA is          379812
value Of Computed T-value is                    .3841202
```

MANAGEMENT RESEARCH PROJECT

OBSERVED	PREDICTED	RESIDUAL	SQUARED	NUMBER
63.7	60.636	3.064003	9.388114	1
60.833	64.262	-3.429001	11.75805	2
60.33	72.021	-11.69099	136.6794	3
61	65.299	-4.298996	18.48137	4
79	63.689	15.311	234.4266	5
64.7	66.71	-2.010002	4.040109	6
70.33	65.08601	5.243996	27.49949	7
59.4	68.661	-9.261002	85.76615	8
66.5	68.02	-1.519997	2.31039	9
65.5	66.64	-1.139999	1.299599	10
64.43	67.028	-2.598	6.749602	11
59	63.998	-4.998001	24.98002	12
71.83	67.702	4.128006	17.01013	13
67.7	62.836	4.863995	23.65814	14
70.5	65.41801	5.081993	25.82666	15
61	62.428	-1.427998	2.039177	16
70.5	70.594	-9.400177E-02		8.836332E-03
17				
70.5	66.173	4.327004	18.72296	18
67	66.814	.1860046	3.459773E-02	
19				
64.6	69.153	-4.552994	20.72975	20
64	68.19601	-4.196007	17.60647	21
60	65.12601	-5.126007	26.27595	22
73.167	72.13301	1.033989	1.069133	23
68	69.207	-1.207001	1.456851	24
73.67	63.32601	10.34399	106.9982	25
71	66.98	4.020004	16.16044	26
65	65.145	-.1449966	2.102403E-02	
27				
62.33	63.80701	-1.477001	2.181533	28
67.33	65.681	1.649002	2.719208	29
65	61.803	3.196999	10.2208	30
72	67.161	4.838997	23.41589	31
60.9	62.86101	-1.961002	3.84553	32
68.7	67.886	.8139954	.6625885	33
75	75.52201	-.5220032	.2724873	34
76.7	68.656	8.043999	64.70592	35
70	63.238	6.762001	45.72466	36
73.6	65.17301	8.426994	71.01424	37
74	62.537	11.463	131.4004	38
69	65.289	3.710999	13.77151	39
60.33	66.368	-6.037995	36.45738	40
63.5	67.429	-3.929001	15.43705	41
63.5	66.203	-2.703003	7.306225	42
62.67	71.109	-8.439003	71.21678	43
66.7	63.451	3.248997	10.55598	44
62.3	64.668	-2.368	5.607425	45
65.67	70.677	-5.007004	25.07009	46
62.2	67.529	-5.328999	28.39823	47
65.3	65.86701	-.5670013	.3214905	48
71.2	67.75801	3.441994	11.84732	49
65.8	67.11601	-1.316002	1.731861	50
61	67.779	-6.778992	45.95473	51
64	68.701	-4.700997	22.09937	52
63.5	64.20101	-.701004	.4914067	53
61.8	68.939	-7.139004	50.96538	54
68.7	66.327	2.373001	5.631134	55
63.7	63.039	.661007	.4369302	56
71	65.304	5.695999	32.41441	57
70.7	67.73801	2.96199	8.773387	58
81	67.986	13.015	169.3902	59
66.3	62.961	3.339005	11.14825	60
68.67	67.47901	1.190991	1.418467	61
62.3	60.308	1.991997	3.968051	62
66.67	67.591	.923996	.8535047	63

[illegible]	[illegible]	[illegible]	[illegible]	63
74.3	70.09601	4.203995	17.67357	64
65.3	70.375	-5.074997	25.7556	65
68.7	61.53001	7.169995	51.40882	66
77	65.736	11.26401	126.8779	67
65.43	63.351	2.079006	4.322267	68
61.3	61.783	-.4829979	.233287	69
72.43	70.828	1.601997	2.566396	70
68.6	66.372	2.228005	4.964004	71
64.25	62.721	1.529003	2.337851	72
66	65.97901	.0209961	4.40836E-04	73
65.9	71.069	-5.168999	26.71855	74
54.6	65.20001	-10.60001	112.3601	75
58.5	70.236	-11.73599	137.7335	76
68	69.207	-1.207001	1.456851	77
73.67	61.806	11.864	140.7545	78
65.2	61.803	3.396996	11.53958	79
65.9	70.205	-4.305001	18.53303	80
54.6	65.20001	-10.60001	112.3601	81
62.7	72.446	-9.745998	94.98448	82
66.33	65.86	.4700012	.2209012	83
66.33	63.18	3.150002	9.922509	84
73.2	72.13301	1.066986	1.138459	85
5665.001	5647.042	17.95894	2682.351	

THEIL's inequality Coeficient Insignificant 4.212524E-02
THEIL'S inequality coefficient is Significant is 4.212524E-02
Value of Squared SUM of predicted values is 375982.1
Value of SUM of squared actual GPA is 379812
value Of Computed T-value is .3841202

```
10 REM
20 REM
40 LET  N=95
45 LET S2=A2=P2=96=0
50 LPRINT,"MANAGEMENT RESEARCH PROJECT"
60 LPRINT "OBSERVED","PREDICTED","RESIDUAL","SQUARED","NUMBER"
70 LPRINT "----------"
80 FOR S=1 TO 95
90 READ P,S1,Y,G
100 REM       :R=residuals
110 REM       :Y=years out of school
120 REM       :M=mathematics
130 REM       :S1=Science
140 REM       :G=actual gpa obtained
150 REM       :Q=Predicted gpa
160 REM       :P=Personality
170 LET Q=73.281+(1.45*Y)+(.57*P)-(.59*S1)
180 LET R=G-Q       :REM R Residual
190 LET S1 = R^2
195 REM S1=residual squared
200 LET S2=S1+S2     REM S2=Sum of squared errors
210 LET P1=Q^2      :REM P1=Predicted value squared
220 LET P2=P2+P1     REM P2=Sum of squared predicted values
230 LET A1=G^2      :REM A1=Actual GPA squared
240 LET A2=A2+A1    :REM A2=Sum of actual gpa squared
245 LET G1=G1+G
250 PRINT G,Q,P,S1,S
255 LET S1=0
256 LET Q1=Q+Q1
257 LET R1=R+R1
260 NEXT S
270 LPRINT "----------"
280 LPRINT G1,Q1,R1,S2
290 LET Q2=(P2/N)^.5
300 LET A3=(A2/N)^.5
310 LET Y1=Q2+A3
320 LET Y2=(S2/N)^.5
330 LET U=Y2/Y1          :REM U=Theil's inequality coefficient
340 LET Z=U^2*(83)
350 LET Z1=1-(U^2)
360 LET Z3=(Z/Z1)^.5
370 IF Z3=<1.66 THEN 390  ELSE 400
390 LPRINT "THEIL's Inequality Coeficient Insignificant",U
400 LPRINT "The value of computed t-value is",Z3
405 LPRINT "Value of SUM of squared actual GPA is",A2
407 LPRINT "value Of Theil's Inequality Coefficient- Significant",U
408 LPRINT "value Of SUM of Squared predicted Values is",P2
410 DATA 14,6,2,66.25,13.5,4.5,3,60.25,9,5.5,2,68.25,13.1,1.5,9.25,10.7,1.61
420 DATA 11,6,2,72.75,9.3,2,59.50,13,5,1,63,14,5.5,1,60,12.5,6,1,63.75
430 DATA 11,7,2,57.5,8.5,6,1,63,13.5,1,68.3,9,7,1,73,11,6,1,75.2
440 DATA 12,5.5,1,71.20,8,4,1,75,11.5,6,2,66.80,8,8,1,64.167,10,7,3,67.8
450 DATA 9,8,2,72.33,9.6,1,75.7,11,4.5,1,74.3,11,6.5,1,77.3,10,6.5,1,70
460 DATA 13,5,3,76.8,9,6,2,60.83,10,6.5,1,72,10,6.5,1,62.8,11,4.5,2,60.5
470 DATA 12,6.5,1,65.5,9,5.5,1,68,6,11.5,5.5,1,62.5,15,5.5,1,66.75,10,6.5,2,62.8
480 DATA 9,6,1,65,11,6,1,64.8,11.5,5,1,63.5,7.5,1,71.75,10,4,3,71.25
490 DATA 8,5,3,58.25,11,6,2,62,9,4.5,5,70,9,6,2,57.8,11,7,2,64.75,12.5,5.5,2,66.1
500 DATA 10,7,2,63.5,7,4,1,68.5,8,5.5,4,63,10,6.5,1,65,13,4,1,63.75,10,7.5,2,
510 DATA 14,8,1,57.3,11,6,1,67.7,8.5,5,2,67.33,11,6,2,64.3,13,7,1,61.5
520 DATA 11,5,1,58.5,14.5,5,1,57.25,10.5,1,56,13,6,2,68,12,4.5,1,60.5,10.5,2,
530 DATA 14,7,1,65.8,10.5,5,79.9,11,6,2,63.50,14.3,2,68.88,10,6.2,71.25
540 DATA 11,6,4,77.25,12.5,2,69.11.5,3,3,79,14,6.5,2,76.625,13,5.5,2,67.5
550 DATA 10,6,2,74.9,11.5,2,70.9,15,8,3,69,12,7.5,1,62.1,13,5.5,2,70.1
560 DATA 12,5,3,68,11,5,2,       ,12,4.5,1,65,10,6.5,1,71.4,2,
570 DATA 9,9,3,52,10,
```

MANAGEMENT RESEARCH PROJECT

OBSERVED	PREDICTED	RESIDUAL	SQUARED	NUMBER
66.25	64.66	1.590004	2.528113	1
60.25	67.28	-7.029999	49.42039	2
68.25	67.805	.4449997	.1980247	3
59.25	66.73	-7.479996	55.95034	4
61	64.9	-3.899994	15.20995	5
72.75	66.37	6.379998	40.70137	6
59.5	69.28	-9.779999	95.61838	7
63	64.37	-1.369995	1.876887	8
60	63.505	-3.504994	12.28498	9
63.75	64.065	-.3149948	9.922173E-02	
10				
57.5	65.78	-8.279999	[illegible]	11
63	66.345	-3.344994	[illegible]	12
68.3	64.37	3.930008	[illegible]	13
73	65.47	7.529999	[illegible]	14
75.2	64.91999	10.28001	[illegible]	15
71.2	64.645	6.555001	42.96803	16
75	67.81	7.190003	51.69614	17
66.8	66.085	.715004	.5112307	18
64.167	65.45	-1.282997	1.646082	19
67.8	67.8	0	0	20
72.33	66.33	6	36	21
75.7	66.06	9.639999	92.92959	22
74.3	65.805	8.495011	72.1652	23
77.3	64.625	12.67501	160.6559	24
70	65.195	4.805001	23.08803	25
76.8	67.27001	9.529999	90.82088	26
60.83	67.51	-6.680001	44.6224	27
72	65.195	6.805001	46.30803	28
62.8	65.195	-2.395001	5.736027	29
60.5	67.25501	-6.755005	45.63009	30
65.5	64.055	1.445	2.088024	31
68.6	66.355	2.245003	5.040037	32
62.5	65.21499	-2.714989	7.371164	33
66.75	62.935	3.815006	14.55427	34
72.8	66.94	5.860001	34.33961	35
65	66.06	-1.059998	1.123595	36
64.8	64.91999	-.1199875	.014397	37
63.5	65.225	-1.724999	2.97562	38
71.75	67.79	3.960007	15.68165	39
71.25	69.57	1.68	2.822401	40
58.25	70.12	-11.87	140.8968	41
62	66.37	-4.370003	19.09692	42
70	72.745	-2.745003	7.53504	43
57.8	67.51	-9.710003	94.28416	44
64.75	65.78	-1.029999	1.060898	45
66.5	66.095	.4050064	.1640302	46
63.5	66.35001	-2.850006	8.122535	47
68.5	68.37999	.1200104	1.440249E-02	
48				
63	71.275	-8.275001	68.47565	49
65	65.195	-.1949997	3.802488E-02	
50				
63.75	64.96	-1.209992	1.464079	51
72	66.055	5.945	35.34302	52
57.3	62.02999	-4.729992	22.37282	53
67.7	64.91999	2.780007	7.728436	54
67.33	68.385	-1.055	1.113026	55
64.3	66.37	-2.07	4.284899	56
61.3	63.18999	-1.889992	3.572069	57
58.5	65.51	-7.009995	49.14002	58
57.25	63.505	-6.254994	39.12494	59
56	66.08	-10.08	101.6064	60
68	65.23001	2.769997	7.672881	61
60.5	65.235	-4.735001	22.42023	62
75	68.71001	6.289994	39.56402	63

65.8	62.61999	3.180012	10.11247	64
79.9	71.88001	8.019997	64.32035	65
63.5	66.37	-2.870003	8.236916	66
68.88	66.43	2.450005	6.002523	67
71.25	66.94	4.309998	18.57608	68
77.25	69.27	7.980001	63.68016	69
69	66.39	2.610001	6.812101	70
79	69.305	9.695008	93.99316	71
76.625	64.365	12.26	150.3077	72
67.5	65.525	1.974999	3.900619	73
74.9	66.94	7.959999	63.36159	74
70.9	66.96001	3.939995	15.52356	75
69	64.36	4.640007	21.52967	76
62.4	67.815	-5.415001	29.32224	77
70.125	65.525	4.599999	21.15999	78
68	68.735	-.7350006	.5402259	79
72.9	66.96001	5.939995	35.28354	80
65.9	65.235	.665001	.4422263	81
71.4	66.965	4.435005	19.66927	82
66.8	66.06	.7400055	.5476081	83
52	74.44	-22.44	503.5537	84
69.1	66.64501	2.454994	6.026997	85
5691.337	5642.88	48.45718	3149.279	

THEIL's inequality Coefficient Insignificant 4.5547736E-02

The value of computed t-value is .4153907

Value of SUM of squared actual GPA is 384043

value Of Theil's Inequality Coefficient- Significant 4.5547736E-02

value Of SUM of Squared predicted Values is 374994.5

APPENDIX E : STEPWISE REGRESSION PROCEDURE

Whereas the variable selection procedures give reliable results when multicollinearity is not a problem, they often produce conflicting results for collinear data. Thus one should not use variable selection methods if multicollinearity is suspected. The usual variable selection technique uses a *stepwise regression* procedure to determine the best regression equation. There are two main versions of this technique: forward selection and backward elimination.

The forward selection procedure begins with the equation that contains no predictor variables. The first variable to be included in the equation is the one that produces the greatest reduction in the error sum of squares. This is the predictor variable with the highest simple correlation coefficient with the given response. Based on a test of hypothesis, if the regression coefficient of this variable is different from zero, the variable is retained in the equation, and a search begins for a second variable. The second variable to enter the equation is the one that effects the greatest reduction in the error sum of squares, given the presence of the first variable.* This is the variable with the highest correlation with the response after the response has been adjusted for the effect of the first variable. If statistical significance is discernible for the regression coefficient of the second variable, the variable is retained and a search begins for a third predictor variable. The process continues in this manner until statistical significance is not discernible for the coefficient of the last variable that has entered the equation.

*Thus difficulties can arise when data are collinear.

[redacted]

The forward selection procedure has been modified so that the possibility of deleting a variable is considered at each stage. This modification produces what is usually identified in computer packages as a stepwise regression procedure. With this method a predictor variable that has entered the regression equation at an earlier stage may be removed at a later stage. The decision process is once again based on the reduction in the error sum of squares and partial F tests and depends on the particular mix of variables that happen to be in the regression equation.

With the development of highly sophisticated computer packages, several other techniques have become available, but the common feature remains the concept of reducing (or increasing) the error sum of squares when a variable enters (or is removed from) the regression, given the presence of other variables. For well behaved data, stepwise regression and backward elimination procedures usually yield the same results. If the results differ, it is often a good indication to take a closer look at the problem and consider additional analyses.

[redacted]

Source : Canaros, G.C.: Applied probability and statistical methods, (Little, Brown & Co., Toronto, 1984) P.488

1. The procedure begins by determining k simple linear regression equations. The F statistic

$$F = \text{MSR}(x_i)/\text{MSE}(x_i)$$

is computed for each $i = 1, 2, \ldots, k$ variables. If the largest F value exceeds a predetermined level of statistical significance, the corresponding variable is the first to be included in the regression. Otherwise the best equation is $\hat{Y} = \bar{Y}$. This process is the same as determining the predictor variable that is most highly correlated with the response.

2. Suppose variable x_1 enters the regression equation in step 1. Now the stepwise procedure calculates all equations with two variables, including x_1. For each case the value of the partial F statistic

$$F = \text{MSR}(x_i \mid x_1)/\text{MSE}(x_1, x_i)$$

is computed to determine whether $H_0: \beta_i = 0$ can be rejected in the presence of x_1. If the largest F value is sufficient for statistical significance, the corresponding second variable is added to the equation.

3. Suppose x_1 is added to the equation in step 2. The procedure continues by examining whether any of the other variables already in the equation should be dropped; in this case it would be x_1. The value of the partial F statistic

$$F = \text{MSR}(x_1 \mid x_i)/\text{MSE}(x_1, x_i)$$

is computed and compared to the predetermined level for significance. If the effect of x_1 given x_i is now not statistically discernible, x_1 is dropped from the equation; otherwise it is retained. At later stages there will be a number of these partial F tests for all the variables that were added earlier. The variable that may be deleted is the one for which the F value is smallest.

4. Suppose x_1 is retained. At this point the regression equation includes x_i and x_1. The stepwise process continues by examining which of the remaining variables is a candidate for inclusion in the model. Then it examines whether any of the included variables should now be dropped. The process terminates

Source: Canavos, G.C.: Applied Probability and Statistical Methods, (Little, Brown and Co., Toronto, 1984) P.493

MINISTRY OF CO-OPERATIVE DEVELOPMENT
THE CO-OPERATIVE COLLEGE OF KENYA

INTERVIEW FORM

(To be completed by the Panel Secretary for each candidate)

Interview No. .....

1. Name of Candidate ..... Male/Female Marital Status .....
2. Home District ..... Interview Centre ..... Date .....
3. Contact Address .....
4. For Pre-Service Diploma in Co-operative Management course candidates are required to have two Principal Passes one of which must be in either Mathematics or Economics plus at least a Subsidiary Pass in either Geography or English Literature or Kiswahili. *(Tick in appropriate column the score obtained by the candidate in the subjects as verified on the original K.A.C.E. Certificate.)*

(TOTAL SCORE - 70 POINTS)

(a) EVALUATION OF K.A.C.E. CERTIFICATE:

PASS GRADE SCORE POINTS	A 20	B 18	C 14	D 10	E 6	Sub 2
Economics						
Mathematics						
Geography						
Kiswahili						
English Literature						

Sub-total ☐

(b) For Diploma Course in Audit only:

K.C.E. Div.I/II plus A.C.N.C. I&II / C.P.A.I ☐ D

5. ORAL INTERVIEW: (Award appropriate mark; total score - 30 points)

			SCORE
(a) Personality	(i)	Physical fitness (3 points)	
	(ii)	Appearance (5 points)	
	(iii)	Language expression & fluency (8 points)	
(b) Interest	(i)	The course chosen & reasons (6 points)	
	(ii)	Idea/knowledge about the course (3 points)	
(c) General Knowledge (two questions)		(3 points)	
(d) Academic Knowledge (two questions)		(2 points)	
		Sub-total	

TOTAL ☐

6. Additional comments on candidate's suitability:-

.....

.....

Signature ..... Date .....

APPENDIX G

MINISTRY OF CO-OPERATIVE DEVELOPMENT

CO-OPERATIVE COLLEGE OF KENYA

RE: ENTRY REQUIREMENTS FOR DIPLOMA COURSES

1. DIPLOMA IN CO-OPERATIVE MANAGEMENT (2 years)

K.A.C.E. with a minimum of 2 Principal level passes, one of which must be either in Mathematics or Economics.

Candidates with a Mathematics and Economics combination will be preferred and will therefore have an advantage.

2. DIPLOMA IN CO-OPERATIVE AUDIT (3 years)

K.C.S.E. with an average grade of C will be the minimum entry requirement. The candidate must obtain a minimum grade C+ in Mathematics and a minimum grade C in either Accounting, Economics or Commerce.

Candidates with a combination of Maths and Economics, and/or Mathematics and Accountancy will be preferred.

(E.N. GICHERU (Mrs.)
PRINCIPAL

/LGAW.

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