A STUDY OF PREDICTIVE VALIDITY OF O-LEVEL, A-LEVEL AND AN APTITUDE TEST IN RELATION TO THE PERFORMANCE AT THE UNIVERSITY OF NAIROBI.

BY: HANIEL JOHN NYAGA GATUMU

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"This thesis is my original work and has not been presented for a degree in any other University."

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Haniel J. Nyaga Gatumu

"This thesis has been submitted for examination with my approval as University Supervisor".

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Dr. W.C. Young

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H.J. Nyaga Gatumu.

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ABSTRACT

This study is an empirical investigation to determine the predictive validity of A-level, O-level and an aptitude test in relation to performance at the University of Nairobi. In this prediction study a sample of about 260 subjects was used. The subjects were admitted to the University in academic year 1972/73 and were students in the following faculties:-

Agriculture, Arts, Architecture, Education and Medicine.

O-level and A-level are achievement tests done by candidates after completing four and six years of secondary school curriculum respectively. The candidates sitting for the O-level do papers ranging from Geography, History, English language etc. (social sciences) to Biology, Mathematics, Chemistry etc. (Pure Sciences). The candidates who proceed on for A-level can either offer Arts (social science) or Science (Pure Science). The A-level is done after two years of study after completion of O-level. Selection into A-level classes is based solely on O-level performance.

The O-level and A-level grades and scores of an aptitude test were used as predictor variables and the standardized scores obtained in University examinations were used as criterion variables. The O-level grades and A-level grades were weighted to make analysis possible. For O-level the weighting system of 9,8,....,2,1 was used for the grades 1, 2,....,8,9 respectively i.e. grade 1 (the best O-level grade) was given a weight of 9 etc. For A-level a weighting system of 6,5,....,1,0 was used for the grades A,....,E,O and F

respectively. A similar kind of weighting system of A-level is used by the selection Board of the University for their selection purposes. The Board uses the A-level grades only. The analyses based on the intercorrelations between variables were carried out namely,

(i) Multiple regression analysis

and (ii) Canonical correlation analysis

It is usually felt that estimates of previous school performance and maximum performance tests are not the only categories of possible predictors. There are two other possible types (Drenth, 1975):-

1. Personality variables
2. Miscellaneous category of biographical information, antecedents, physical qualities, socio-economic factors, linguistics, racial and tribal background variables etc.

In this study, however, attention has been paid only to previous school performance and maximum performance test (aptitude test) in predicting performance at the University of Nairobi.

The multiple regression analysis showed A-level to have an appreciable predictive efficiency for university examinations in these faculties:

(i) Architecture during second and third year

(ii) Medicine in both first and second year.

O-level has predictive efficiency in medicine during first year. The aptitude test score has a predictive efficiency in

faculties of:-

(i) Agriculture during first and third year

and (ii) Education in first year.

For the faculty of Medicine the study showed that the set consisting of O-level, A-level and English language is more efficient as a predictor of first and second year university examination than best single predictor, A-level. For Architecture the optimum prediction can be achieved by considering A-level and aptitude test when we take second year university examination as a criterion. The optimum prediction can be obtained by considering aptitude test, O-level and Mathematics in faculty of Education when first year performance is taken as a criterion.

The canonical correlation analysis showed it is only in faculty of Medicine in which the set of five predictors (i.e. English language grade, Mathematics grade, O-level grade aggragate, A-level grade aggragate and aptitude test score) can predict the university success at level of significant less than 0.05. The university success (a linear combination of either two or three criterion variables) can be predicted with greater accuracy for medical students followed by Architecture, Arts, Education and lastly Agriculture students.

The study has shown that A-level does exhibit satisfactory predictive validity but not in all faculties considered, hence the evidence in the study does not lend strong support to use of A-level for selection to all faculties in the University.

CHAPTER ONE

INTRODUCTION

Prediction studies provide the researcher with three types of information:-

1. The extent to which a criterion behaviour pattern can be predicted.
2. Data for theory building about possible determinants of the criterion behaviour pattern.
3. Evidence regarding the predictive validity of the test or tests that are correlated with the criterion (Borg & Gall, 1971).

Prediction studies can be differentiated in terms of which of these types of information the researcher is most interested in obtaining. In some studies the emphasis is on a particular criterion behavior (e.g. first year University examination grades or final year University performance) and one or more examination grades or personality and aptitude tests are used to predict this criterion. Those tests that are good predictors should then be applied to practical problems such as selection for university admission. In other studies, a researcher might be primarily interested in theoretical significance of his findings, following a similar kind of research design as in criterion behaviour.

Prediction research has made a major contribution to educational practice. Many prediction studies have been aimed at short-term prediction of student's performance in a specific course of study, and others have been aimed at long-term prediction of general academic success.

The findings of the studies have greatly aided school and university personnel in choosing students most likely to succeed in a particular academic environment or course of study. Also prediction studies provide the scientific basis for the teacher's effort to help students plan their academic future. Another type of prediction research has been concerned with establishing methods of predicting vocational success. Vocational interest tests in the countries where administered have proved highly effective in predicting a person's future occupation. Also, as the cost of training new personnel for today's complex vocational skills increases, the saving to be realized by effective selection and prediction procedures also increases. For instance university employing the selection system for prediction of success in every course offered, can save vast sums of money because it would eliminate a certain number of persons who are likely to fail during the training program. Because such training is extremely costly and because the cost of training the unsuccessful candidate up to the point of failure must be added to the per capita cost of training successful candidates it may be seen that a prediction program that will reduce the number of failures can be of extremely great value.

The non-changing selection practices might lead one to assume that the prediction of university performance has reached a state of complete maturity, satisfying to most practitioners. Instead there is increasing concern and dissatisfaction with the current state of the art. There are two major sources of dissatisfaction

levelled at the similar kind of art in western countries from where the art has been borrowed. These are:-

1. The popular colleges and most scholarship and honours programs, and in our local case, some of the professional degrees, have many more applicants than they can accept. After applicants with low grades or low test scores are eliminated, further discriminations must be made between the remaining highly qualified candidates. The selection committee can make these on the basis of the remaining small differences in test scores and high school rank, they can look at other data, such as interviewer's impression, a recommendation or an autobiography, or they can flip a coin. These three methods of discriminating between student with good grades and high test scores are about equally valid when judged by the criterion of later student performance. Educational researchers have been busy searching for indicators of success other than grades and test scores (usually called non-intellective predictors) and some have been found. However none has yet achieved enough demonstrated success to be widely adopted.

2. There is growing dissatisfaction with the use of college grades on the criterion for evaluation of predictors. Some educators are beginning to feel that the student who makes the best grades is not necessarily the most valuable student. For instance Stalnaker (1965) said

"....we want to find students who will succeed in college - but much more important, will also use their college education in some socially desirable, productive [illegible] after graduation. How relevant are grades to this goal?.....Do you inquire of your accountant, your physician or your lawyer the grades he received in college? Predicting grades has little social significance. Hollard and Richard (1965) have pointed out that a student's extracurricular achievement may be similar to achievement after graduation than is the academic achievement represented by grades. They demonstrated that academic and extracurricular achievement in college are not highly correlated and urged greater use of extracurricular achievement as an alternative criterion to grades in the development of selection devices. Hoyt (1965) concluded from a review of relevant studies that there is little relationship between college grades and post-college achievement.

Validity is often not the sole value in a selection program, and the use of non intellective scales raises some issues which, although always present are hidden when intellectual predictors are used. Stalnaker (1965) stated the issue well when he said (prophetically) "in a program very much in public eye, predictive validity alone cannot rule.....suppose there should develop sound evidence that among the highly intelligent, the most conforming compulsive, dependent, unoriginal individuals do best in college". Then Stalnaker

poses a question, "should we then try to limit our selection to students having these characteristics?" Stalnaker's hypothetical example is only a slight exaggeration of the content of the non intellective grade scales.

It has not been infrequent that researchers have called for a thorough examination of the validity of grades. Intuitively, most researchers recognize that grades have poor measurement characteristics and that any statistical manipulation based on them lead to many kind of erroneous conclusions. According to Yonge (1965):

> Many investigators have been moving away from the old model of predicting intellective criteria (e.g. grades) to intellective predictors (e.g. ability tests).....

It has been the tendency of researchers to conclude that the grades are valid just by investigating whether the correlations are significant while forgetting that the coefficients of correlation can be too low, though significant, for any practical predictive use.

The study will validate to an extent the opinion strongly held by the employers that there is a big relationship between the success in the school and success in a job. Since there are many employers who will not even give one an employment interview if one's schools record is poor. Such an attitude may seem unfair, but employers presume that if one has ability and did not use it in school, one is not serious about his

future. They have found that success in school is the best predictor of success on the job.

There is an acute lack of opportunities in secondary and tertiary education. For instance the number of pupils qualified for high school in this country considerably exceeds the number of high school places available, and as a consequence the number of pupils who can be admitted. A rejection rate of about 80 percent is not at all rare, in 1975 the rejection rate was about 72 percent[1] and in 1976 it was about 77 percent.[2] The same is true, although to a somewhat lesser extent for universities and schools of higher vocational training. Consequently, admission policy for secondary and higher education is usually very 'strict'.

In western countries the view has sometimes been put forward that, once a student has become qualified for a certain type of school (e.g. high school) he has a right to be admitted. If for some reason only a restricted number of applicants can be accepted, this right should lead to selection on the basis of drawing lots among the group of qualified applicants. This point of view is bound to be challenged on educational, ethical, and economic grounds even in western countries, but certainly in developing countries where the need for optimal use of scarce educational resources as well as the urge for quick development require that some form of rational selection should be adopted.

1,2 the figures were obtained from official reports from examination office in the Ministry of Education, Nairobi.

Hence in general principle, those who have the biggest chance of successfully completing the course within given limits of time should be admitted.

This brings us to a very important question, how can we determine one's chances of future school success in a valid, reliable and effecient way? Though in this study the concern is a previous performance for predicting future success, it should be remembered that estimates of previous school performance and maximum performance tests are not the only categories of possible predictors; as indicated earlier.

Admission to the next level in the educational system on the basis of previous school performance, can as well be justified by two statements of reasoning which at first glance might appear to be identical, though in reality are different:

1. Education or training in a higher level of institution assumes a number of skills or a certain level of knowledge, or may assume both, acquired in the previous school. If the student has not acquired the assumed knowledge or skill, he cannot benefit from the subsequent learning experience.

2. Previous school performance reveals qualities within the students that are also needed in next learning institution. The history of scholarstic attainment is used as a predictor of future school performance, since both are supposed to be dependent on the same "learning ability". The probability of success

depends on student performance, low performance decreases and high performance increases the probability.

When one does a study on predictive validity, one is confronted with a far-reaching difficulty of considering the quality of education exposed to each subject (in my study this aspect will be neglected, another study could be prepared to look at the factor). School performance is dependent upon at least two important variables; the student's level of scholastic aptitude and the quality of education. Where the quality of education is more uniform, and can be considered to be relatively similar, the variance in school grades can be considered as a reflection of student's ability for learning. But when the quality of education varies widely the school performance is not a valid and reliable indicator of student's capabilities. This implies, in those cases where school performance is used as a predictor for future school success, and for selection and admission purposes, that students from poorer schools are discriminated against.

A number of other environmental factors also influence school performance in varying degrees. These include socio-economic status, cultural and linguistic differences, and so on. Whenever a "non ability" factor discriminates between students with better and poorer school performance, the use of the school performance variable as a predictor seems less justified. Though this might be 'less justified' it does not necessary mean that past school performance does not correlate

with future performance. Hence it is worthwhile appreciating that what we measure by our tests is always the result of learning process, influenced by many factors, including the quality of education and the diversity of stimuli in the individual environment.

The view that previous school grade will have predictive validity is of course based upon the assumed or demonstrated similarity between learning process and requirements in both school and university. But wherever for instance the high school does not necessarily impart the scholastic skills that are essential for university learning, then predictive validity of previous school grades is low. This being still another factor which might be responsible for a low correlation between previous school grades and future performance.

The central purpose of this study which is empirical is to determine the degree of predictive validity of one kind of selection device, the most common device used by the university of Nairobi in the selection of applicants for admission to the university. In this study a sample of about 260 subjects was used. The subjects were admitted to the university in academic year 1972/73 and were students in the following faculties:- Agriculture, Arts, Education, Architecture and Medicine. In the same study the predictive validity of an aptitude test was considered.

The O-level and A-level grades and an aptitude test scores were taken as predictor variables and the standardized

scores obtained in university examinations were taken as criterion variables. Analyses based on the intercorrelations between variables were carried out, namely, multiple regression analysis and canonical correlation analysis.

O-level and A-level are achievement tests done by candidates after completing four and six years of secondary school curriculum respectively. The candidates sitting for the O-level do examination papers ranging from Geography, History, English language etc. (social sciences) to Biology, Mathematics, Chemistry etc. (Science). The candidates who proceed for a A-level can either offer Arts (social science) or Science. The A-level is done after two years of study after completion of O-level. Selection into A-level classes is based on O-level performance.

DEFINITION OF TERMS:-

Validity of a test is high if the test measures what it is supposed to i.e. if it gives the information the decision maker needs. No matter how satisfactory it is in other respects, a test which measures what it is not supposed to is worthless.

Validity can be classified as:

(i) Predictive validity

(ii) Concurrent validity

(iii) Content validity

(iv) Construct validity

(i) Predictive validity:-

Very often especially in selection or classification

the decision is based on a person's expected future performance as predicted from the test score. If these expectations are confirmed the test has given highly useful information but if the predictions do not correspond to what happens later, the test was worthless. To know how validly the test predicts, a follow up study is required. For instance, a predictor such as a students' rank in his secondary school graduating class, predicts a criterion such as his average university grade during the freshman year.

(ii) Concurrent Validity

In many situations for which tests are developed some more cumbersome method for collecting information is already in use, for instance tests intended for clinical diagnosis are compared with the judgments made by a psychiatrist who interviews each patient. This kind of check in which two sources of information are obtained at nearly the same time is the one called "concurrent validity." Concurrent and predictive validity differ essentially in time factor.

(iii) Content Validity:-

If a course is supposed to teach a unit e.g. 'probability,' it would not be fair to measure its effectiveness by a test on a different unit e.g. 'Calculus'. The tester interested in evaluation

needs to ask "Does this test represent the content or activities I am trying to measure? Does this test give a fair measure of performance on some important set of tasks the candidate has been exposed to?"

(iv) Construct Validity:-

The tester is interested in what the scores mean psychologically or what causes a person get a certain test score.

CHAPTER TWO

REVIEW OF LITERATURE:-

A study was done by B.N. Mukherjie (1965) of Indiana University on "the prediction of grades in introductory psychology from tests of Primary Mental Abilities (PMA). The study involved an evaluation of the degree to which semester grades in introductory psychology are predicted from certain selected tests of PMA. The PMA battery selected consisted of eight tests namely; vocabulary, sound grouping, reading, completion, verbal analysis, verbal classification, reasoning and punched holes. Out of eight tests of PMA selected only two predicted satisfactorily the total grade point in beginning college psychology. The two tests were vocabulary and sound grouping test. This conclusion was reached after carrying out product moment correlation, and stepwise multiple regression analysis. Mukherjie concluded that it would be an unwise use of time to administer the entire PMA battery for the purpose of predicting success in beginning college psychology.

For the sample studied, it seemed that the following regression equation gave an optimum estimate of the total psychology scores at the introductory level

$$Y'_i = 0.507X_{1i} + .268X_{2i}$$

Where Y'_i is the total psychology score for individual i and X_{1i} and X_{2i} denoted respectively the scores on the vocabulary

and sound grouping tests of primary mental abilities. The test of vocabulary turned out to be the best single predictor. Mukherjie went on and said, "As is well known vocabulary plays an important role in most college courses. It is no surprise therefore to find that students having a better vocabulary scored higher in the psychology examinations."

J.M. Plapp, G. Psathas of Washington University and D.V. Caputo of Washington University of Medicine (John M. Plapp and co-workers, 1965) in their study on intellective predictors of success in nursing school found a test requiring two hours and twenty minutes (2 hours 20 min.) of performance was a more successful predictor of clinical grades, for the nurses studied, than was a measure representing four years of high school performance. The test was the scholastic Aptitude test of the college entrance examination (SAT).

A study done by Edmond Marks of Pennsylvania State University and J.E. Murray of U.S. Army (Marks & Murray, 1965) on "Nonadditive effects in the prediction of academic achievement" revealed that the relationship between college academic achievement and a composite of high school average (HSA) and secondary school characteristics was much more subtle than that suggested by a linear, additive approach. Whenever a given secondary school is highly oriented to preparing students for college work, one might expect the characteristics of that school - particularly the behaviours of the administration, faculty and students to be more similar to those of the typical college or University than are the

characteristics of a secondary school not so oriented. Some secondary schools are more 'like' colleges or universities than are others. This suggests that HSA does not uniformly provide the same amount of information about college academic performance for all subjects but provides differential amounts as a function of similarity between secondary school and college characteristics.

Reginald L. Jones (Jones, 1962) of Miami did a study of the validity of pre-engineering ability test (PEAT) and the study was designed to answer the following two questions:-

(i) Is the PEAT valid as a predictor of performance in pre-engineering program

and (ii) Is it, more efficient as a predictor of the criteria than a general test of scholastic Aptitude Test - "American College Testing Program" (ACT).

The criteria in the study were freshman chemistry and freshman mathematics grades being obtained from courses taught by several instructors and hence were subject to usual shortcomings of data of this type. The statistical technique employed in this study was zero - order correlation coefficients[1] and multiple correlation coefficients along with 't' tests of the significance of differences between

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1. This is the ordinary correlation coefficient in which we ascertain to predict one variable from another as compared to 'multiple' correlation coefficients in which we attempt to predict one variable by using several other variables as a team of predictors.

correlation coefficients. The findings were:-

> The PEAT proved to be as valid a predictor of first semester grade point average in the pre-engineering curriculum as well as predictive of grades in selected prengineering relevant courses. In addition the study showed, the PEAT predicted the above criteria as well as a general test of scholastic aptitude (ACT).

William B. Michael and co-workers (Michael, 1962) carrying out intercorrelations of college and high school grade point average (GPA), verbal scores, mathematics scores, and total (unweighted) scores, all three of the scholastic aptitude test of the college entrance examination board (CEEB) along with pertinent multiple correlation coefficients relative to a criterion of grade point average earned by 209 men and 233 women during their freshman year in a liberal arts college came out with these findings:-

1. for both sexes high school GPA was more predictive of success in college than either part scores or total scores of the CEEB.
2. A least square linear combination of high school GPA and CEEB total scores or of high school GPA and differentially weighted verbal and quantative CEEB scores yields a higher predictive validity (multiple correlation coefficient) than does any one predictor.

3. The achievement of women in the liberal arts college studies can be predicted with greater accuracy than that of men.

Still in another study by Richard W. Boyce and R.C. Paxson (Boyce & Paxson, 1965) both of Troy State College (Alabama) on "The predictive validity of 11 tests at one state college," in which they wanted to determine estimates of the local predictive validity of various standardized aptitude tests which had been used in admissions and guidance programs as well as of tests on several non-cognitive variables, all carried out with a sample from their local college, had the following observations to offer:-

1. The predictive validity of some of the 11 tests at their local college were not consistent with that found in most validity studies at other colleges across the nation.

2. A negative correlation between measures of creativity and dogmatism which indicated that both the tests and grades were tapping the more convergent rather than divergent abilities.

3. In their cross validation study, they found the students over the years have been very much alike on the variables measured i.e. the correlation in the cross validation sample were similar to those of the validity sample.

The study was done because they felt that though the

predictive validity of national representative sample was available the discrepancies in predictive validity coefficients are bound to change as a local college departs from a national sample.

Eckhoff, C.M. (Eckhoff, 1966) of Winona State College in a study entittled, "predicting graduate success at Winona State College", in which he was to investigate the relationship between selected background variables namely,

(i) Undergraduate grade point average

(ii) Miller analogies Test Scores

and (iii) Advanced Education Section Scores from the graduate Record Examination;

and achievement in graduate courses at Winona State College and to determine how accurately these variables predict achievement, he had the following observations to make:-

1. Optimum prediction of graduate success for secondary education majors can be made by using a least-square regression function containing background variables of undergraduate grade point average and a score on the miller analogies test.

2. Optimum prediction of graduate success for elementary education majors can be made by using a least-square regression function containing background variables of undergraduate grade point average and a score on the Advanced Education section of the graduate record examinations.

A study carried out by Simeon Akeju and William Michael (Akeju & Michael, 1970) using a group of students from Federal School of Science (FSS) Lagos, Nigeria revealed that:-

1. An achievement examination based on high school subjects given just prior to the student's admission to the FSS was the most valid predictor of subsequent success one year later as defined by scores (i.e. achievement). A standardized scholastic aptitude test prepared by the American Institute of Research or an interview rating did not do as well as the achievement examination.

2. In the prediction of each of several criterion variables a most favorably weighted combination of predictors consisting of achievement tests, an interview, and a scholastic aptitude test was only slightly more valid than was the use of an optimally weighted combination of the six achievement tests alone.

3. From an actuarial standpoint relatively little increase in the accuracy of prediction of academic success at the FSS was to be gained from the use of an interview or schlastic aptitude test, although in individual cases such measures might be helpful for counseling.

4. For the Nigeria sample studied the validity coefficients determined from individual predictors

and for selected combinations of predictors were comparable to the findings for American Colleges that had been reported in integrated reviews of the literature concerned with the prediction of academic success.

In another study done by Thomas Goolsby (Goolsby, 1970) on validity of the college level examination program (CLEP) with a number of college sophomore student, the study employing 1967 and 1968 sample, came out with these findings:-

CLEP exhibits satisfactory measurement characteristics on most counts and excellent ones on a few. However, the evidence in the study does not lend strong support to use of CLEP for selection, placement and advisement at the sophomore level when it is considered alone and especially when grade point average (GPA) is a criterion. Of course, there is need to question the desirability of the use of GPA as a criterion.

There is evidence in the study to support the need for a very substantial emphasis on adequate measurement and grading practices within the university. Thus both a vigorous determination and definition of curricular objective and the construction of criterion measure (cognitive and affective) in a continuing research program are necessary for higher education to meet its responsibilities for selection, placement and advisement.

Still in another study carried out by Kwa-Yann Hwang

and Henry F. Dizney (Hwang & Dizney, 1970) of University of Oregon on predictive validity of the test of English as a foreign language (TOEFL) for Chinese graduate students at an American University brought out these observations:-

> Though the empirical evidence was limited, TOEFL was a relatively good predictor of grades in English as a second language (ESL) for Chinese graduate students at University of Oregon. However its use to predict the academic success of Chinese graduate students was doubtful.

These conclusions were reached after the correlation between ESL and TOEFL and that of TOEFL and Grade point average (GPA) were examined. The sample in this study was small hence it would not be reasonable to extend findings to other American Universities and Colleges for there is likehood of it (sample) being unique.

A.L. Sockloff, R.K. Ebert and J.W. Degnam all of Temple University (Sockloff, Ebert & Degnam, 1973) on their study entittled "adjustment for high school characteristics in the prediction of college achievements" in which the study included use of:-

1. a cross validation sample separated by several years from the prediction sample.
2. Standardized tests on a part of the predictor battery in order to maximize the generality and applicability of the results.
3. An adjustment method through which it is possible

to analyse all students with complete data, regardless of the high school attended, had the following contribution to make:-

The prediction of academic achievement within a single university was improved by adjusting predictions on the basis of a multiplicative weight which measures the relative mean success of former graduates from each of the various feeder high schools. Where comparisons could be made in the cross validation samples, the weighted method was found to be superior to the non-weighted method and equal to the multiple regression formula method. However, all methods suffered from shrinkage which may have resulted in part from differences in the scholastic ability of students in the prediction and cross-validation samples.

And a recommendation was, the use of weighted method or the multiple regression formula method, could conceivably be improved by pooling several freshman classes to derive a larger total prediction-sample and by using a measure of achievement in high school with greater range and sensitivity. Otherwise, there is some questions as to whether the gains in predictive efficiency are warranted by the difficulty in applying such adjustment methods.

A recent study carried by Oscar T. Lenning and E. James Maxey (Lenning & Maxey, 1973) of the American College Testing program on "American College Testing program (ACT) versus

scholastic Aptitude Test (SAT) prediction for present-day colleges and students" brought out these findings:-

> For most colleges, in the sample studied, the results obtained suggest that the ACT tests were at least as efficient predictors of college overall GPA as were the SAT tests.[1]
>
> In the study SAT variables were used as local predictors or ACT tests and high school grades in predicting various college course grades. Most of the colleges included other local predictor variables in addition to the ones mentioned above for determining the multiple regression estimate of grade point average (GPA). Eight of the 17 colleges studied had both SAT and ACT as local predictor scores available - a situation which meant that the SAT multiple correlation with GPA could be compared directly to the ACT multiple correlation with GPA. At only one college was SAT multiple correlation decidedly higher than multiple correlation of ACT. The sample size was small as compared to the other seven with both SAT and ACT as local predictors.

Another important generalization was also suggested

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1. In Nigeria SAT was not an efficient predictor of performance in Federal school of science (FSS) as an achievement examination based on high school - subjects which was administered to the students just before joining the FSS. (Michael & Akeju, 1970)

by the data. When the accuracy of prediction is relatively low for one test battery (either the ACT or SAT), it is also generally modest as well for the other test battery. This outcome is probably true because of the fact that, except for highly selective colleges with extremely homogenous student population an ability, low correlation with GPA are usually the result of diverse grading practices and standards within the college. For the several high ability colleges, the low-observed correlations are probably the result of homogeneity due to selection. If they were adjusted for selection, those correlations would be much higher. It is impossible to obtain a higher predictive correlation than the index of reliability of the criterion. It is well known college grades tend to be relatively unreliable at many institutions.

For colleges where grades are very unreliable it is definitely desirable to use the test scores rather than predicted college grades as criteria for placement in remedial courses. Since standardized scholastic aptitude tests (whether they be ACT or SAT) have high reliability as compared with grades, a simple explanation exists regarding why the dean at one college reported relatively inaccurate prediction was found at his college, but all the same the ACT tests were still useful for placement purposes.

It would not be valid to say that the ACT-versus-SAT finding of the study applied to college across

the United States as a whole. This group of 17 colleges studied was probably not a representative national sample of colleges. However, since it was a varied group of colleges, additional support was provided for the finding of earlier studies that the ACT battery predicts as well as does the SAT.

It should be remembered that estimates of previous school performance and maximum performance tests are not the only categories of possible predictors. There are two other possible types (Drenth, 1975)

1. personality variables, measured by means of personality tests, self rating or observation scales. There is a vast literature and a great deal of empirical research to demostrate that this category is not by any means negligible. Motivation, anxiety, interests, attitudes and values, stability and adaptation are examples of variables that have an important influence on school performance, and certainly not only with respect to people who suffer from behavioval disorders, neurotic maladjustment and organic pathologies. Although they evidently play a predominant role among this group. However, there are two major variables. In the first place, there are psychometric problems in that the measurements are often insufficiently reliable, and secondly there is the inconsistent and complicated way in

which they cause or influence behavior and performance. To avoid misunderstanding these difficulties do not mean that no energy should be spent on measuring such variables. On the contrary, in order to have a complete picture of maximum predictability they can hardly be left out.

2. The miscellaneous category of biographical information, antecedents, physical qualities, socio-economic factors, linguistic, racial and tribal background variables, etc. Some of these would prove to have a very high validity in the psychometric sense, but a great many would at the same time be 'discriminators' in the full sense of the word."

CHAPTER THREE

DESIGN OF STUDY

HYPOTHESESES

This study attempts to answer the following questions:-

(i) How well do A-level and O-level grades predict the performance at University of Nairobi?

(ii) Is prediction more valid in some faculties than others? i.e. Are A-level and O-level examinations, as instruments of selection, more valid in some faculties than others?

(iii) Is the Aptitude test valid as a predictor of performance in the University of Nairobi, in particular in any faculty under the study?

(iv) Is it more efficient as a predictor than O-level or A-level?

(v) Is there a group of predictors which is more efficient than that used by the University of Nairobi?

These questions can be answered by the following hypotheses:-

(i) Achievement in A-level and O-level do not predict performance in University of Nairobi examinations.

(ii) The degree of predictive validity coefficients of A-levels and O-levels is the same for all faculties in the University of Nairobi.

(iii) The Aptitude test does not predict performance in university examinations.

(iv) There is no difference between predictive validity coefficients of the Aptitude test and that of A-level and O-level examinations with respect to the performance in the University of Nairobi.

(v) The predictive validity coefficient obtained from a linear combination of the predictors is not different from that obtained from the single predictor used by the University of Nairobi.

METHODOLOGY:-

The data for university examinations and secondary school achievement examinations were obtained for the students in the study group. For most of them, their academic achievements in the university examinations were followed up to the final year of their degree work. Their scores in an aptitude test which was administered to the group in the beginning of academic year 1972/73 were also obtained. It was administered to them when they were in first year.

The secondary school achievement examinations were O-level and A-level. The grades of both A-level and O-level were obtained and the following weighting systems were adopted:- For A-level a system of 6,5,....1,0 was used for the grades A,.....,E,O,F respectively. This is similar to that used

by the selection Board of the university for their selection purposes. For O-level the weighting system of 9,8,....2,1 was used for the grades 1,....,9 respectively i.e. grade 1 (the best O-level grade) was given a weight of 9 etc. The weighting was done to make analysis possible in one case and in the other case to make it less cumbersome when dealing with the results of analysis.

The raw university examinations scores which in some cases consisted of about eight test scores, for each academic year, were standardized so that each set of scores had a mean of 50 and standard deviation of 10. With these standard scores it was possible to obtain for instance a meaningful first year university examination performance. The first year university examination performance, Y_1, was obtained by summing up and taking the mean, for each student, all standard scores obtained in the first year. This mean was used as one of the criterion variables. The others are Y_2 and Y_3 which are second year university examination performance and third year examination performance respectively both obtained in the same manner as that used for the first year.

Intercorrelations between criterion variables Y_i, where i = 1,2,3, and predictor variables X_i, where i = 1,2,3, 4....., were obtained. The intercorrelations were used to decide what predictor variables to use in the multiple regression and canonical analyses.

There was a plan of carrying out a stepwise multiple

regression analysis so as to get predictor variables which give positive return but the computer facilities were inadequate for doing that. Hence an alternative way adopted which was to look at the intercorrelations and select the predictor variables which correlate significantly with the criterion variables. For that reason English language (ENG) and O-level mathematics (MATHS) were selected as predictor variables. Beside these two, the Aptitude test (APT) scores, the aggragate for the 6 best O-level grades (OLEV) and the aggragate for the A-level grades (ALEV) were also taken as predictor variables. Using these five variables as predictor variables and the three university examination performances each as criterion variables, a multiple regression analysis and a canonical correlation analysis were done.

A multiple regression analysis was initially carried out using the whole sample of subjects regardless from which faculty they came from. Later analyses using samples of subjects from the same faculties were carried out. The number of subjects from the 5 faculties were as follows:-

	Education	107
	Architecture	86
	Agriculture	29
	Arts	23
and	Medicine	23

A canonical correlation analyses were done using the same samples as used for multiple regression analyses, as

well as the variables. Hence it was a kind of survey, seeking to find out which method of analysis might provide us with better information as far as prediction of the performances in the university is concerned.

APTITUDE TEST - The Aptitude test (Young, 1972) was administered to a group of students in the first year of study in the university of Nairobi at the beginning of the academic year 1972/73. A total of about 300 took the test. The test consisted of 72 questions done in 90 minutes. The questions on a face validity basis could be classified into three groups depending on thought process necessary for solution. In each group the difficulty level varied widely among the questions in the same group. The three groups more appropriately referred to as factors were extracted when a factor analysis (Principal Component) was done. Hence the test was measuring three main dimensions.

OUTLINE OF THE APTITUDE TEST:-

1. Vocabulary 1 - Questions 1-12;

   There were 12 questions in this section. In each question the candidate was given a word and the task was to find the word having opposite meaning among the five words given as possible answers.

2. Mathematics 1 - Questions 13-17

   The five items involved a simple matrix and subjects were shown clearly what a row and a

column of a matrix are. Then they were required to do simple problems involving a concept of rows and columns of a matrix.

3. Vocabulary II - Questions 18-27

The candidate was required to choose and insert the correct word in a blank to complete a sentence.

4. Verbal anelogies - Questions 28-37

Two words were given which had certain relationship to each other this was followed by five other numbered pairs and out of five, the candidate, was required to choose the pair which illustrated the same relationship as the original pair.

5. Mathematical sequence - Question 38-39

These two items were on mathematical sequence of integers.

6. Alpabetical series - Questions 40-47

The items were on alpabetical sequence and the candidate was required to choose the correct letters to make a suitable sequence of letters.

7. Mathematics III - Questions 48-72

The questions were essentially requiring simple mathematical manipulations.

Each of the 72 questions had 5 alternatives and candidates were required to choose the correct response from the set given at the end of each question.

46 of the 72 items exhibited significant loadings on 3 factors extracted. Each item exhibiting significant loading on one factor. The clustering of the 46 items was consistent with the predicted clustering, despite very few anomalous results. Those items on vocabulary and verbal analogies were identified essentially to belong into either of two factors extracted. The mathematical item identified exhibited their loading on other factor extracted.

Cross Validation Study:-

Once the regression equation or equations are constructed, a cross validation can be done. This can be done with the subjects not in the, normative sample or with the subjects, admitted to the university at a latter date. Using the regression equations, it is possible to get predicted criterion score for each subject in cross validation sample and using the actual score Y and predicted criterion score Y^1 it is possible to calculate the ordinary product moment correlation coefficient between Y and Y^1 in the cross validation sample. This will give "cross-validation multiple R" symbolised by R_c. If the magnitude of R_c is reasonably close to that of R^1 (R corrected for shrinkage) we would be fairly confident that, in subsequent sample too, the predictive efficiency will be more or less of this degree.

The R_c for each group from each faculty can be obtained and statistical tests can be performed to determine whether they are significantly different from zero.

Of course cross validation studies are needed to ascertain whether the results reported in the study can hold true for a new sample. However the sizes of the samples were small hence it was not possible to split the samples so as to have samples for carrying out cross validation study with.

STATISTICAL MODEL:-

The study is concerned with predictive validity of achievement tests (O-level and A-level) and an aptitude test. The following predictors were chosen:-

1. O-level Mathematics (MATHS) grades
2. O-level english language (ENG) grades
3. Aptitude test (APT) scores
4. Aggragate for six best O-level grades (OLEV)
5. Aggragate for A-level grades (ALEV)

These were grades or scores obtained by each individual subject in the sample. The criterion variables were, the three years' standardized university examination performance denoted by Y_i where i=1,2,3. For instance Y_2 represents second year university examination performance (mean score of standardized second year examinations scores). It is possible to construct a multiple regression equation of the form

$$Y_i^1 = a + b_1X_1 + b_2X_2 + \ldots\ldots + b_5X_5$$

Where Y_i^1 is the predicted criterion score and $X_1, X_2, \ldots, X_5$ represent values of the predictor variables MATHS, ENG,.....,

ALEV respectively. When we construct regression equations we assume that all variables (predictors and criteria together) jointly follow a multivariate normal distribution. Strictly speaking, no real data follow a multivariate normal distribution exactly, for this is a mathematical model.

The model most commonly employed in the prediction of academic achievement, the bivariate or K-variate linear regression model, is inappropriate for handling the relationship among the variables, if the variables employed do not follow a multivariate normal distribution. The assumption of multivariate normal density function implies linearity in the parameters (the homogeneity of error variance) and a condition perhaps too often ignored, of additivity of effects i.e. the covariance matrix for any subject of the variables employed is a constant function of the remaining variables of the total set. Whenever the regression of the criterion upon one or more predictors is not independent of some one or more predictor variables, this condition of additivity is not met, and the use of the linear regression model is not strictly appropriate. The use of term "Strictly" suggests that in most cases the violation of this assumption is small in a practical sense and that the linear regression model yields a tolerable approximation to the joint regression surface.

Where significant interaction effects are present the use of the linear regression model yields predicted criterion values which in effect do not 'fit' any of the subjects. Several methods have been proposed for handling such cases.

Characteristics of these methods is the introduction of estimable interaction term into the regression function, thus the criterion is expressed as a polynomial function in the predictors. The homogeneity of error variance and additivity effect have been taken care of since we do not have varied kinds of predictors, the predictors are uniform from subject to subject. We have O-level, A-level and aptitude test which were offered by every subject and there is not much variation in grading system of these predictors. Hence there is a justification in assuming a statistical model of k-variate regression where the equation is assumed linear in the independent variables (predictors).

The multiple regression analysis gives the values of the estimates of the regression weights and also their standard errors. Hence the predicted criterion score can be obtained and the relationship between the predicted and actual criterion score gives the multiple correlation coefficient.

Although regression equations are mostly used to get a 'point prediction' (i.e. the best guess numerical score) on the criterion variable for an individual with a given combination of predictor scores, it is possible under certain conditions to put them to a more sophisticated use. For example to get answers to question such as "What is the approximate probability that an individual with that combination of predictor scores will get a criterion score above specified value?" In other words "What are the chances that this individual will succeed?" By proper use of the

obtained results in multiple regression analysis the foregoing question can then be answered. Thus multiple regression can help us answer "What are the chances that a student who obtains certain results in O-level or A-level will succeed in a course like Engineering or Medicine at University of Nairobi?

For every subject in the sample it was possible to get predicted criterion score (e.g. predicted performance in first year examinations in the university) Y^1 as well as the actual criterion score Y. The correlation between Y and Y^1 is defined as 'multiple correlation coefficient'

$$R = r_{YY^1}$$

This is, of course, like any correlation coefficient and is treated similarly. Hence with the value it is possible to make a statistical test to predict how valid, for instance, are secondary school achievement examinations as predictor for the performance in the university. Strictly speaking this is the theoretical method for obtaining multiple correlation coefficient but in most cases the following method is used for obtaining it (R):-

> The first thing to compute is a predictor correlation matrix $\underline{R}$ i.e. the correlation matrix of the predictor variables. Then a vector $\underline{K}$ which contains the correlations between the predictor variables and the criterion variables is computed.

The required vector of beta weights $\underline{\beta}$ is then computed from the relationship

$$\underline{\beta} = \underline{K} \cdot \underline{R}^{-1}$$

Where $\underline{R}^{-1}$ is the inverse of the matrix $\underline{R}$.
Hence in practice, the multiple correlation coefficient R, is computed from the relationship

$$R^2 = \underline{\beta} \cdot \underline{K}$$

i.e. the square root of the inner product of vector $\underline{K}$ and vector $\underline{\beta}$ gives the multiple correlation coefficient.

If we are given a subpopulation with a given combination of predictor scores; $X_1, X_2, \ldots, X_p$; then the actual criterion scores Y of all individuals in this subpopulation follow a normal distribution whose mean and standard deviation can be estimated by the predicted criterion score Y^1 for that particular combination of predictor scores, using the obtained regression equation

$$Y^1 = a + b_1X_1 + b_2X_2 + \ldots\ldots + b_pX_p$$

The standard error of predicted criterion scores is estimated by $Sy\sqrt{1-R^2}$

Where Sy is standard deviation of Y in the normative sample.

Having established the foregoing, it is a simple matter to estimate the probability that an individual with a given

predicted criterion score Y^1 will actually earn a criterion score which does not fall between a specified cut-off score.

Testing Significance in multiple regression:-

The significance of a multiple correlation may be tested by calculating a variance ratio, F, or by calculating chisquare using an L-criterion which is given by

$$L = 1-R^2$$

and chisquare itself is given by

$$\chi^2(tdf) = -\left[n-1-\tfrac{1}{2}(t+2)\right]\log_e L$$

Where t is the number of predictor variables. The variance ratio, F, which is preferred to chisquare is ratio of predicted to non-predicted variance. The predicted variance has degrees of freedom t and non-predicted variance has degrees of freedom n-t-1. The variance ratio is

$$F_t^{n-t-1} = \frac{R^2}{t} \Big/ \frac{1-R^2}{n-t-1}$$

The variance ratio test suggests that there exists a relationship between multivariate analysis of variance and multiple regression methods. It is possible that some multiple correlations are too low, though significant, for any predictive use; but if a predictor or a group of predictors is found to have statistical values that are significant in many of the cases, though low, there is no reason why it cannot be taken seriously.

CANONICAL CORRELATION:-

Through least squares analysis, it is possible to form two linear combinations one for the independent variables, X_p, and for the dependent variables, Y_q. In other terms, it is possible to calculate the regression on weighted combination of dependent (criterion) variables upon a weighted combination of independent (predictor) variables. Hence a natural extension of multiple regression known as canonical correlation analysis is feasible. The correlation between the two linear combinations is the canonical correlation. Suppose there are two sets and let the variables in the first set be denoted by $X_1, X_2, \ldots, X_p$ and those in second set be denoted by $Y_1, Y_2, \ldots Y_q$. We construct two linear combinations of the set as:-

$$N = a_1X_1 + a_2X_2 + \ldots + a_pX_p$$

and $$R = b_1Y_1 + b_2Y_2 + \ldots + b_qY_q$$

The correlation r_{NR} between the two combination can be computed. This correlation coefficient is referred to as canonical correlation coefficient.

If any set of weights is linearly independent or orthogonal to the other set of weights in both cases a correlation which is zero is obtained. If the set is independent a trivial linear combination of which the weights are all zero is obtained and consequently a zero correlation

with any other set. Independence can be considered as an extreme case of orthogonality for any set that is independent is orthogonal to any other set although the converse is not true.

To obtain the weights $a_1,\ldots,a_p$ and $b_1,\ldots,b_q$ eigenvalues (latent roots) and eigenvectors (latent vectors) are first computed. Each eigenvalue obtained will be associated with a particular eigenvector, which is a linear combination of predictor and criterion variables. Thus each eigenvalue will give rise to the weights of the variables. With the weights it is possible to obtain standard score for each subject on each one of the two sets of variables (criterion and predictor). Principal component analysis (factor analysis) and canonical analysis are related techniques and canonical analysis has been loosely characterised as a sort of "double-barelled principal component analysis." Canonical correlation is also related to multiple regression in that the eigenvalue in canonical correlation analysis corresponds to the square of multiple correlation coefficient in multiple regression analysis i.e. The square of the canonical correlation which is the eigenvalue, is an estimate of the variance shared by the two linear combinations. With one criterion variable - multiple regression - there is one multiple correlation. With q criterion variables - canonical analysis - there are q canonical correlations. The number of canonical roots is equal to p or q, whichever is less, where p is the number of predictor variables and q is the

number of criterion variables.

A set of regression weights is known as canonical vector, and the set of derived score which results when the weights are applied to standard scores is known as a canonical variate. The canonical correlation coefficients are usually reported in descending order of size. The first canonical correlation therefore represents the maximum possible correlation between any weighted linear combination of predictor variables and any weighted linear combinations of criterion variables.

The similarity between principal component (factor analysis) and canonical analysis has been mentioned. This similarity is due to the same analytic trick that is used to display the structure of relationship across domains of measurement.

The trick in both is to reduce the dimensionality to a few linear functions of the measures under study. While factor model selects linear functions of tests that have maximum variances, the canonical model selects linear functions that have maximum covariances between domains, and in both cases the model study is subject to the restriction of orthogonality.

Interpretation of canonical analysis:-

The research worker, however, is not interested only in success of a prediction as facilititated by canonical analysis but also in the reasons why the prediction is

successful. By looking at the relative weights of the tests in the weighting vectors which may be used to calculate a canonical variate, we can be able to interpret the meaning of the predictors. In other words, we look at the relative magnitudes and signs of the several combining weights defining each canonical variate and see what meaningful psychological interpretation we can make.

Suppose that the variables with largest weights for first two pairs of canonical variates or canonical correlation were as shown.

First canonical correlation

Predictors	Criteria
High positive weights	High positive weights
(i) MATHS	(A) second year performance
(ii) APT	(B) Third year performance
Predictors	**Criteria**
High negative weights	High negative weight
(i) ALEV	(A) first year performance
(ii) ENG	

Second canonical correlation

Predictors	Criteria
High positive weights	High positive weights
(i) OLEV	(A) Third year performance
(ii) ENG	

High negative weights	High negative weights
(i) APT	(A) second year performance
(ii) ALEV	

With these kinds of hypothetical results we can conclude that second and third year performance can be well predicted by maths and aptitude test, while first performance can well be predicted by looking at how well one has done in English and A-level. And similarly using the results of second canonical correlation we can say that O-level and English predict the performance in third year, while second year performance is predicted by Aptitude test and A-level.

In the study the interpretation will be made with weights from the canonical variate (canonical correlation) which are significantly different from zero.

CHAPTER FOUR

THE ANALYSIS AND DISCUSSION OF RESULTS:-

Three kinds of analysis were carried out. These were:-

1. Intercorrelation analysis
2. Multiple regression analysis

and 3. Canonical correlation analysis

INTERCORRELATION ANALYSIS:-

In the analysis of the results, 33 variables were considered. Table I gives a list of the variables and the names of variables used in the analysis.

Table I

Variables and names of variables used in nalysis:-

Variable No.	Variable	Name used
1.	O-level Mathematics	MATHS
2.	" English Language	ENG
3.	" English Literature	LITO
4.	" Physical Science	PHY
5.	" Physics	PHYO
6.	" Chemistry	CHEMO
7.	" Biology	BIO
8.	" Geography	GEO
9.	" History	HISTO
10.	" Swahili	SWO

Variable No.	Variable	Name used
11.	O-level Agriculture	AGR
12.	" Divinity	DIVO
13.	" French	FREN
14.	" Health Science	H/SC
15.	" Art	ARTO
16.	A-level Chemistry	CHEMA
17.	" Physcis	PHYA
18.	" Biology	BIA
19.	" Mathematics	MATA
20.	" Swahili	SWA
21.	" Geography	GEA
22.	" Economic	ECON
23.	" English Literature	LITA
24.	" Applied Mathematics	AM
25.	" Pure Mathematics	PM
26.	" Arts	ARTA
27.	" History	HISTA
28.	" Divinity	DIVA
29.	" General paper	GP
30.	Aptitude Test	APT
31.	First year Uni. examination performance	Y_1
32.	Second year University examination performance	Y_2
33.	Third year university examination performance	Y_3

Table II is the symmetric matrix of frequencies. The diagonal elements in this symmetric matrix give the number of subjects who offered each single examination paper, for example the (4,4) element is 121, indicating that 121 subjects offered physical science (PHS) regardless of what other examination papers they offered. The (4,25) element gives the number of subjects who offered both physical science and Pure Mathematics. In other words off diagonal elements in table II indicate the number of subjects who offered various combinations of variables.

TABLE II

MATRIX OF FREQUENCY FOR THE WHOLE SAMPLE

	MATHS	ENG	LITO	PHS	PHY	CHEM	BIO	GEO
MATHS	224	221	141	120	32	39	182	206
ENG		224	151	119	33	41	192	222
LITO			153	77	18	21	126	141
PHS				121	0	0	105	115
PHYO					34	31	32	29
CHEMO						42	39	35
BIO							195	179
GEO								225
HISTO								
SWO								
AGR								
DIVO								

TABLE II (CONT.)

	HISTO	SWO	AGR	DIVO	FREN	H/SC	ARTO	CHEMA
MATHS	180	70	7	145	11	83	11	78
ENG	198	83	7	164	12	100	12	78
LITO	134	40	3	101	6	50	7	46
PHS	98	34	5	78	4	28	5	59
PHYO	16	9	1	13	3	5	1	12
CHEMO	19	13	1	21	5	6	2	19
BIO	153	56	7	125	9	67	10	75
GEO	187	72	7	152	7	90	10	73
HISTO	200	66	4	141	7	84	8	53
SWO	:	84	1	55	2	32	2	29
AGR			7	3	0	1	1	3
DIVO				166	3	75	2	43
FREN					12	3	2	8
H/SC						100	3	18
ARTO							12	4
CHEMA								79
PHYA								
BIA								
MATA								
SWA								

TABLE II CONT.

	PHYA	BIA	MATA	SWA	GEA	ECON	LITA	AM	PM	ARTA
MATHS	65	51	64	11	118	80	47	7	3	3
ENG	66	51	63	17	123	85	59	7	3	4
LITO	36	30	36	3	86	54	52	4	1	1
PHS	48	40	40	3	59	33	20	5	3	3
PHYO	15	3	18	1	16	13	5	2	0	0
CHEMO	19	11	19	1	19	11	7	2	0	1
BIO	63	49	56	5	97	66	42	7	3	4
GEO	59	47	59	15	122	80	51	7	3	4
HISTO	38	33	43	15	112	81	55	5	1	2
SWO	25	19	24	14	36	26	21	2	0	1
AGR	3	3	2	1	4	2	0	1	0	0
DIVO	32	35	35	14	93	59	45	4	2	0
FREN	7	4	5	0	2	2	1	0	0	1
H/Sc	14	17	14	12	53	44	29	1	1	0
ARTO	4	0	7	1	7	5	3	0	0	3
CHEMA	53	49	36	0	20	1	1	2	1	2
PHYA	66	29	42	0	4	1	0	6	3	3
BIA		51	11	0	18	1	0	0	0	0
MATA			65	1	23	19	2	0	0	2
SWA				17	6	5	1	0	0	0
GEA					128	60	35	1	0	1
ECON						86	22	1	0	0
LITA							60	0	0	1
AM								7	2	0
PM									3	1
ARTA										4

Table II Cont.

	HISTA	DIVA	GP	APT	Y_1	Y_2	Y_3
MATHS	79	30	193	331	215	221	191
ENG	92	42	206	241	232	240	207
LITO	69	24	141	151	144	149	131
PHS	32	9	105	119	116	119	94
PHYO	5	2	29	33	32	34	30
CHEMO	6	3	35	41	41	42	33
BIO	68	25	172	192	184	191	159
GEO	81	33	191	222	213	221	195
HISTO	88	38	171	198	192	197	180
SWO	26	17	66	84	82	83	70
AGR	0	0	5	7	7	7	7
DIVO	73	36	140	166	157	162	143
FREN	3	3	11	11	12	12	8
H/SC	50	25	80	100	95	98	89
ARTO	1	0	11	11	12	12	11
CHEMA	1	0	72	76	75	79	52
PHYA	0	0	57	63	61	66	38
BIA	0	0	46	49	51	51	27
MATA	3	0	63	64	59	65	53
SWA	1	9	4	17	17	17	17
GEA	59	18	120	128	125	126	125
ECON	49	9	77	86	82	84	81
LITA	43	15	59	60	56	56	53
AM	0	0	5	7	6	7	7
PM	0	0	2	3	3	3	3
ARTA	0	0	4	3	4	4	4
HISTA	95	25	85	95	89	92	87
DIVA		42	30	42	39	39	37
GP			211	209	201	207	180
APT				264	250	259	228
Y_1					253	252	220
Y_2						262	229
Y_3							229

The correlation coefficients based on frequencies in Table II are reported in Table II. The significant correlation coefficients are also indicated on the table.

TABLE III

MATRIX OF INTERCORRELATION FOR THE WHOLE SAMPLE:-

	MATHS	ENG	LITO	PHS	PHYO	CHEMO	BIO
MATHS							
ENG	02						
LITO	05	24*					
PHS	56	10	13				
PHYO	61**	10	-23				
CHEMO	46**	05	09		59**		
BIO	39**	26*	10	58**	41**	35*	
GEO	30**	26*	11	26**	12	15	48**
HISTO	10	25	04	-08	13	20	12
SWO	18	18	-01	21	-08	-19	30*
AGR	00	-48	50	82**			72*
DIVO	10	17*	25*	10	-44	-15	12
FREN	-29	29	48	76		38	35
H/SC	40**	24	19	33	-46	72*	58**
ARTO	43	-15	13	79*			38
CHEMA	23*	06	18	32	48	41*	16
PHYA	32**	06	18	06	09	-12	16
BIA	10	09	05	03	-87	22	14
MATA	18	-06	-27	-09	62**	48*	-01
SWA	-39	29	87	94*			34
GEA	-10	04	03	06	14	54**	03
ECON	-07	23	-22	22	38	63	12
LITA	-18	23	20	-03	53	24	06
AM	92**	-26	87*	53			22
PM	-50	36		50			19
ARTA	14	46		98*			1.00*
HISTA	-10	00	-16	08	08	18	-04
DIVA	10	19	30	-13		50	18
GP	-13	12*	-07	-04	21	47**	03
APT	39**	25*	23*	21*	32*	21	37**
Y_1	15*	16*	13	07	30*	09	14*
Y_2	03	12*	13	-02	02	08	15*
Y_3	01	24*	04	-01	20	16	15*

TABLE III Cont.

	GEO	HISTO	SWO	AGR	DIVO	FREN	H/SC	ARTO	CHEMA
MATHS									
ENG									
LITO									
PHS									
PHYO									
CHEMO									
BIO									
GEO									
HISTO	24								
SWO	37**	11							
AGR	10	80							
DIVO	28*	20*	27*	87					
FREN	11	32			65				
H/SC	60**	24*	09		41**	24			
ARTO	25	05					98*		
CHEMA	01	-00	-24	1.00 **	-12	74*	54**	66	
PHYA	-08	09	-07	87	-31*	59	25	17	25*
BIA	01	-14	-08	33	02	74	07		40**
MATA	07	-07	21		-30	24	-07	04	-16
SWA	54*	70**	30		38		06		
GEA	12	15	-01	77	00		12	37	-19
ECON	07	-03	42		-28	-05	-05	04	
LITA	-02	-18	40		-05		-20		
AM	12	54			67				
PM									
ARTA	37							93*	
HISTA	24*	30**	02		15	50	19		
DIVA	15	10	61**			27	98*	41*	
GP	-00	11	-00	00	-03	02	-04	12	08
APT	28*	05	15	52	07	25	25**	12	15
Y_1	19*	09	03	24	21*	51*	28**	44	21*
Y_2^1	-01	07	11	42	20*	38	22*	26	23*
Y_3^2	06	10	01	47	15	57	34**	21	28*

TABLE III CONT.

	PHYA	BIA	MATA	SWA	GEA	ECON	LITA	AM	PM	HISTA	
MATHS											
ENG											
LITO											
PHS											
PHYO											
.											
.											
.											
.											
CHEMA											
PHYA											
BIA	30										
MATA	30*	25									
SWA											
GEA	-94**	-09	-11	80*							
ECON			23	36	05						
LITA					00	-09					
AM	82*										
PM	50										
ARTA	76										
HISTA					05	04	-14				
DIVA				54	55**	04	46*				23
GP	23*	14	08		-16	14	11	54		69	08
APT	19	02	04	05	00	06	05	06	99*	79	00
Y_1	52**	31*	18	28	10	33*	14	53	08	07	10
Y_2	42**	36**	13	43°	08	09	-03	72*	97*	08	09
Y_3	50**	29	14	49*	11	15	02	61*	82	33	13

TABLE III Cont.

	DIVA	GP	APT	Y_1	Y_2
MATHS					
ENG					
LITO					
.					
.					
.					
.					
.					
.					
.					
.					
PM					
ARTA					
HISTA					
DIVA					
GP	-19				
APT	23	-02			
Y_1	31*	05	25**		
Y_2	37*	-04	12*	41**	
Y_3	17	07	20**	48**	71**

* indicates $p < 0.05$

** indicates $p < 0.01$ and decimal points have been omitted.

The following conclusions can be drawn from Tables II and III:-

(i) ENG correlates significantly with Y_1, Y_2 and Y_3.

(ii) MATHS correlates significantly only with Y_1.

(iii) APT correlates significantly with Y_1, Y_2 and Y_3.

(iv) Others which correlate with Y_1, Y_2 and Y_3 (i.e. their correlation coefficients are significantly different from zero at 0.05 level with all the three) are:-

1. BIO
2. H/SC
3. CHEMA

and 4. PHYA

From the above results it was felt that in broader terms it would be better to look at O-level aggragate (OLEV), English language grades obtained in O-level (ENG) and mathematics grades obtained in O-level (MATHS). The Aptitude test score (APT) and its subtest scores Vocabulary (VOC), Numeric items (NUMER) and abstract items (ABST) and the aggragate of the A-level grades (ALEV) were also selected to complete the set of predictor variables. The set of criterion variables was Y_1, Y_2 and Y_3.

Table IV reports the frequency matrix of the selected predictors and the criterion variables. Table V gives the

intercorrelation coefficients between these variables based on frequency reported in table IV.

TABLE IV

The frequency table of the selected predictor variables and the criterion variables for the whole sample

	MATHS	ENG	APT	OLEV	ALEV	VOC	NUMER	ABST	Y_1	Y_2	Y_3
MATHS	224	221	221	225	214	214	214	211	215	221	191
ENG		244	241	245	236	234	234	231	232	232	207
APT			264	245	236	257	256	253	250	259	228
OLEV				248	239	237	237	234	236	244	211
ALEV					241	230	230	227	229	237	204
VOC						257	256	253	244	252	223
NUMER							256	253	243	251	222
ABST								253	240	248	219
Y_1									253	252	220
Y_2										262	229
Y_3											229

TABLE V

The intercorrelation matrix of selected predictor variables for the whole sample:-

	MATHS	ENG	APT	OLEV	ALEV	VOC	NUMER	ABST	Y_1	Y_2
MATHS										
ENG	02									
APT	39**	25**								
OLEV	52**	50**	37**							
ALEV	07	11	09	21**						
VOC	12	32**	65**	27**	08					
NUMER	44**	10	78**	29**	05	15*				
ABST	18**	16*	48**	24**	01	13*	33**			
Y_1	15*	16*	25	27**	31**	32**	10	02		
Y_2	03	12*	12	14*	24**	19**	-02	07	41**	
Y_3	01	24**	20**	19**	25**	21**	09	08	48**	71**

* indicates $p < 0.05$

** indicates $p < 0.01$

decimal points have been omitted

From tables IV and V the following conclusions can be drawn:-

1) ALEV has the highest correlation coefficients with the university examination performances (Y_1,Y_2, Y_3) among the major predictor variables and all these coefficients are significantly different from zero at the 0.01 significant level.

2. OLEV is the next major predictor with high correlation coefficient with the criterion variables.

3. APT and ENG take the next position

4. Splitting the APT into the 3 subtests brings out clearly that VOC is the only subtest among these three which correlates significantly with the performances, (Y_1,Y_2 and Y_3) at university of Nairobi. Infact Y_1,Y_2 and Y_3 all give correlation coefficients significantly different from zero (at .01 level of significance) with VOC. Hence VOC and ALEV have relatively higher correlation coefficient than the other predictor variables. Does this mean VOC and ALEV are the best single predictors of the performance in the University of Nairobi?

5. There is evidence from the correlation coefficients between Y_1,Y_2, and Y_3 to support the consistency in measurement and grading practices within the university. The three correlation coefficients between Y_1 and Y_2, Y_1 and Y_3, and Y_2 and Y_3, are

significant at 0.01 level. Does this imply the university examinations tend to test similar kinds of abilities? This question cannot be answered at this stage.

MULTIPLE REGRESSION ANALYSIS:-

Correlation analysis will indicate the degree to which the variables are related. The analysis is often inadequate. Usually the criterion variable will be affected by a great variety of factors rather than just one. Multiple regression analysis provide a means of measuring the joint effect of many predictor variables on the criterion variable. The method is a more powerful and a more realistic tool of analysis than correlation analysis.

Multiple regression analysis was carried out using first Y_1 then Y_2 and Y_3 as dependent (criterion) variables and for each of the three analysis, OLEV, ALEV, APT, ENG and MATHS were used as independent (Predictor) variables. The analysis was done with the whole sample then with subsamples consisting of subjects from the same faculty. Later it was thought that by splitting the APT into 3 components, vocabulary (VOC), Numeric (NUMER) and Abstract (ABST) a better prediction can be made. Hence further multiple regression analyses were done in which the Y_1, Y_2 and Y_3 were dependent variables and the independent variables were:-

MATHS, ENG, OLEV, ALEV, VOC, NUMER and ABST.

For all the tables on multiple regression analysis results the following is the procedure of presenting the data.

1. The multiple correlation coefficient given for each independent variable (MATHS, ALEV etc) is the coefficient obtained when that particular independent variable is excluded from the regression set. The multiple correlation coefficient (considering all independent variables) is given at the bottom of each table.

2. Partial correlation coefficients given are the correlation coefficients of each independent variable with the dependent variable, assuming other independent variables in the regression set are held constant.

3. Both regression weights and student's t-statistics used to determine whether the regression weights are significantly different from zero are given. Those t-statistics which are significant are indicated by (**) if significant at 0.01 level and * if significant at 0.05 level.

4. The significant R'S are indicated similarly.

The following were the results obtained using the whole sample:-

<u>Tables showing the regression weights, t-statistics, partial correlation and multiple correlation coefficients associated with each criterion variable for whole sample</u>:-

TABLE VI. 1

CRITERION VARIABLE : Y_1. N=268 (Whole sample)

Variables	Weights	t-stat	Part. Corr	Mult. Corr.
CONSTANT (CONST)	40.70			
MATHS	.01	.03	.00	.132
ENG	- .29	.56	- .03	.127
OLEV	.10	.69	.04	.125
ALEV	.22	.87	.05	.121
APT	.07	.80	.05	.122

MULT CORR. 0.132

TABLE VI.2 CRITERION VARIABLE: Y_2 N=268

CONST	44.55			
MATHS	.16	.47	.03	.147
ENG	.19	.47	.03	.147
OLEV	- .04	.33	* .02	.148
ALEV	.33	1.64	.10	.112
APT	.05	.67	.04	.144

MULT. CORR. 0.150

TABLE VI: 3

CRITERION VARIABLE: Y_3, N=268

Variables	Weights	t-stat.	Part. Corr.	Mult. Corr.
CONST	46.76			
MATHS	- .62	0.94	-.06	.129
ENG	-.89	1.20	-.07	.121
OLEV	.12	.56	.03	.137
ALEV	-.35	.94	-.06	.129
APT	.07	.50	.03	.138

MULT CORR. 0.141

For the whole sample, there was no regression weight which was significantly different from zero at 0.05 level. There was also no multiple correlation coefficient significantly different from zero.

Using the set of 7 predictors variables, in which the components (subtests) of the APT are taken instead of the aptitude test the following resulted for the whole sample:-

Tables showing the regression weights, t-statistics partial correlation and multiple correlation associated with each criterion variable for the whole sample:-

TABLE VII. 1: CRITERION VARIABLE: Y_1, N=268

Variables	Weights	t-stat.	Part. Corr.	Mult. Corr.
CONST	40.92			
MATHS	.40	.95	.06	.17
ENG	- .27	.58	- .04	.18
OLEV	.09	.69	.04	.18
ALEV	.18	.75	.05	.17
VOC	.25	1.49	.09	.16
NUMER	- .31	1.93	- .12	.14
ABST	.46	.93	.06	.17

MULT CORR .18

TABLE VII. 2

CRITERION VARIABLE: Y_2, N=268

CONST	42.27			
MATHS	.16	.45	.03	.21
ENG	- .53	1.36	- .08	.19
OLEV	.18	1.75	.11	.18
ALEV	.12	.57	.04	.21
VOC	.29	2.04	.13	.17
NUMER	- .18	1.32	- .08	.20
ABST	- .05	.13	- .01	.21

MULT CORR 0.21

TABLE VII: 3

CRITERION VARIABLE: Y_3, N=263

	Weights	t-stat	part. Corr	Mult. Corr.
CONST	41.05			
MATHS	- .69	1.05	- .07	.16
ENG	- 1.10	1.55	- .10	.15
OLEV	.10	.04	.00	.18
VOC	.37	1.42	.09	.15
NUMER	- .13	.50	- .03	.17
ABST	.46	.62	.04	.17

MULT CORR = .18

None of the multiple correlation coefficients is significant in this case. But there is a regression weight which is significantly different from zero. This is the regression weight of VOC with Y_2. All the regression weights of ENG with Y_1, Y_2 and Y_3 are negative.

Though the two other weights of VOC with criterion variables Y_1, Y_3 are not significant it seems that VOC is a good predictor of these criterion variables. The two weights of VOC with Y_1 and Y_3 are both positive.

Mukherjie of Indiana University (Mukherjie, 1965) carrying out a similar kind of study on student studying psychology found among several tests, vocabulary was the best single predictor of psychology course. The finding here is very much consistent with his conclusions that vocabulary plays an important role in most college and university

courses. Hence it is not surprising to find that students having better vocabulary score higher at the university. Mukherjie also concluded it would be an unwise use of time to administer the entire battery (including other tests) for the purpose of predicting success in psychology course, similarly it would be an unwise use of time to administer the the entire aptitude test for the purpose of predicting sucess in the university of Nairobi. Administering only the vocabulary subtest serves the purpose.

The following were the results obtained from sample of Education students.

Tables showing the regression weights, t-statistics, partial Correlation and multiple correlation associated with each criterion variable for the Education Student sample:-

TABLE VIII. 1

CRITERION VARIABLE: Y_1 N=107 (Education sample)

Variables	Weights	t-stat	Part. Corr.	Mult. Corr.
CONST	35.09			
MATHS	.04	.05	.01	.33*
ENG	- 1.42	1.73	- .17	.29
ALEV	- .47	1.01	- .10	.31*
APT	.36	2.24*	.22	.25

MULT CORR .33*

TABLE VIII. 2

CRITERION VARIABLE: Y_2 N=107

CONST	40.77			
MATHS	- .10	1.14	- .01	.16
ENG	- .36	.44	- .04	.15
OLEV	.06	.28	.03	.16
ALEV	- .05	.11	- .01	.16
APT	.23	1.45	.14	.07

MULT CORR .16

TABLE VIII. 3

CRITERION VARIABLE: Y_3 N=107

Variables	Weights	t-stat.	Part. Corr.	Mult. Corr.
CONST	34.80			
MATHS	.35	.39	.04	.27
ENG	- .93	.94	- .09	.26
OLEV	.23	.80	.08	.26
ALEV	- .59	1.05	- .10	.26
APT	.34	1.75	.17	.22

MULT CORR 0.27

Non significant results are obtained except with Y_1. The APT has a positive regression weight significantly different from zero at 0.05 level with Y_1. The other two weights of

APT with Y_2 and Y_3 are also positive and relatively high though not significant. Both ENG and ALEV have negative weights with the all the criterion variables.

The least square linear combinations[1] of the following sets of the predictors yielded multiple correlation coefficients significantly different from zero with Y_1 for Education students sample.

1. All the 5 predictors (ENG,MATHS,APT,OLEV,ALEV)
2. APT,OLEV,ENG,MATHS
3. APT,ALEV,ENG,MATHS
4. APT,ALEV,ENG,OLEV

Observe when we exclude ENG or APT from the rest of the predictors the multiple correlation coefficient, R, obtained in both cases is not significantly different from zero. Their partial correlations with the criterion variable, Y_1, are relatively high, though that between ENG and it (Y_1) is negative. This implies among the set of the predictors APT turned out to be better predictor of Y_1, in faculty of Education, than other predictors.

The set of 7 predictor variables, in which the components (subtests) of the APT are taken instead of the APT itself gave the following results for Education students' sample.

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1. "The least square linear combinations" have been refered to simply as 'linear combinations' in the text that follows.

Tables showing the regression weights, t-stat., Partial Correlation and multiple correlation with each criterion variable for Education students' sample:-

Table IX. 1 Criterion Variable: Y_1

Variables	Weights	t-stat.	Part. Corr	Mult. Corr.
CONST	37.77			
MATHS	.96	1.26	.13	.37*
ENG	- 1.27	1.58	- .16	.36*
OLEV	.24	1.06	.11	.38*
ALEV	- .47	1.05	- .10	.38*
VOC	.69	2.70**	.26	.30
NUMER	- .46	1.74	- .17	.36*
ABST	.77	.99	.10	.38*

MULT CORR 0.39*

Table IX: 2 Criterion Variable: Y_2

Variables	Weights	t-stat	part corr.	Mult Corr
CONST	42.28			
MATHS	.27	.34	.03	.23
ENG	- .73	.85	- .08	.22
OLEV	.16	.64	.06	.22
ALEV	- .40	.84	- .08	.22
VOC	.43	1.58	.16	.17
NUMER	.05	.20	.02	.23
ABST	- .18	.22	- .02	.23

MULT CORR 0.23

TABLE IX: 3 CRITERION VARIABLE: Y_3

CONST	38.20			
MATHS	.91	.93	.09	.28
ENG	- 1.23	1.19	- .12	.27
OLEV	.19	.66	.07	.29
ALEV	- .51	.88	- .09	.28
VOC	.67	2.05*	.20	.22
NUMER	- .06	.18	- .02	.30
ABST	- .30	.30	- .03	.30

MULT CORR 0.30

The following are the conclusions which can be made using tables IX. i

VOC has a positive regression weights with all the three criterion variables Y_1, Y_2 and Y_3. Two of the three are significantly different from zero. These are the weights of VOC with Y_1 and Y_3.

Significant multiple correlation coefficients are obtained with, Y_1. The results do not differ from those obtained before the splitting of APT.

ALEV and ENG have negative regression weights with all the three criterion variables.

VOC is the best single predictor for Y_1, Y_2 and Y_3 in the faculty of Education. The results also show that ALEV

is among the worst predictors of the performance in the faculty of Education.

For the first year performance in the faculty of Education the optimum prediction of the performance can be achieved by considering VOC, MATHS, OLEV and ABST as a set. The splitting of the APT into the three components has brought out clearly that the VOC component is the most important APT test component in predicting the performance in faculty of Education.

The followimg were the results obtained with the medical students' sample before splitting APT:-

Tables showing statistical data with each criterion variable for medical students' sample:-

Table X. 1 CRITERION VARIABLE: Y_1, N=23

Variables	Weights	t-stat	Part. Corr.	Mult. Corr.
CONST	8.22			
MATHS	- .60	.32	- .08	.87*
ENG	.07	.06	.01	.87*
OLEV	.82	2.11*	.46	.84*
ALEV	1.17	2.65*	.54	.82*
APT	- .08	.74	- .18	.87*

MULT CORR 0.87*

Table X.2 CRITERION VARIABLE: Y_2, N=23

Variables	Weights	t-stat	Part. Corr.	Mult Corr
CONST	14.38			
MATHS	- .72	.25	-.06	.74*
ENG	.60	.31	.08	.74*
OLEV	.59	.99	.23	.73*
ALEV	1.42	2.08*	.45	.66*
APT	- .12	.74	-.18	.73*

MULT CORR 0.74*

The following are the conclusions which can be made using tables X, i, (for medical students' sample):-

OLEV, ALEV and ENG have positive regression weights with all the criterion variables Y_1 and Y_2. In particular, ALEV has significant weights with all the two criterion variables OLEV has significant weight with only Y_1. The multiple correlation coefficients obtained are all significant.

Here ALEV predicted the performance for both first and second year university examinations. OLEV predicted performance only in first year.

The linear combinations of the following sets of the predictors yielded multiple correlation coefficients significantly different from zero with Y_1 for medical students'

sample. These are listed in their descending order of their predictive efficiency:-

1. MATHS, OLEV, ALEV, APT - ENG Excluded
2. ENG, OLEV, ALEV, APT - MATHS "
3. ENG, MATHS, OLEV, ALEV - APT "
4. ENG, MATHS, APT, ALEV - OLEV "
5. ENG, MATHS, APT, OLEV - ALEV "

From this listing it is clear that for predictive purposes A-level is the best single predictor for first year performance in faculty of medicine. However, the predictive efficiency of others should not be underrated for when we exclude the A-level aggragate from the set of predictors we still obtain a multiple correlation which is significantly different from zero.

With Y_2 as criterion we find the descending order of predictors for medical students is as given below:-

1. ENG, OLEV, ALEV, APT, - MATHS excluded
2. MATHS, OLEV, ALEV, APT - ENG "
3. MATHS, OLEV, ALEV, ENG - APT "
4. MATHS, ALEV, ENG, APT - OLEV "
5. MATHS, ENG, OLEV, APT - ALEV "

The order has not changed very much from that for Y_1 as a criterion. It is only MATHS and English Language which have interchanged positions. A-level is still the best single predictor followed by O-level then aptitude test. Just as found with Y_1, by excluding (ALEV) from the predictor set

we still find the linear combination so formed by remaining set of predictors with Y_2 still yields a multiple correlation coefficient which is significantly different from zero.

For the faculty of medicine the following results were obtained when the components of the Aptitude test where considered:-

Table XI. 1 CRITERION: Y_1 N=23

Variables	Weights	t-stat	Part-Corr.	Mult. Corr
CONST	15.49			
MATH	.78	.42	.11	.90*
ENG	- .43	.35	- .09	.90*
OLEV	.77	2.09*	.47	.87*
ALEV	.64	2.10*	.48	.87*
VOC	.48	1.45	.35	.89*
NUMER	- .08	.28	- .07	.90*
ABST	- 2.64	2.04*	- .47	.87*

MULT CORR 0.90*

Table XI.2 CRITERION Y_2 N=23

CONST	25.79			
MATHS	1.44	.53	.14	.83*
ENG	- .26	.15	- .04	.83*
OLEV	.46	.85	.21	.82*
ALEV	.74	1.67	.40	.80*
VOC	.85	1.73	.41	.79*
NUMER	.06	.14	.04	.83*
ABST	- 4.75	2.53*	- .55	.75*

MULT CORR. 0.83*

The following are the deductions which can be made from Tables XI. 1 and XI. 2:-

All the multiple correlation coefficients obtained are significantly different from zero at 0.05 level for the sample.

Here the regression weights found to be significant before splitting of APT are no longer significant. There is only one weight which is significantly different from zero. This is the weight of ABST with Y_2 and is negative. The regression weight of VOC with Y_1 is positive, and so is the weight of it (VOC) with Y_2. Before splitting of APT, APT was found to have negative regression weights with both Y_1 and Y_2 hence it is clear that ABST was contributing for nearly all this negative weight.

Clearly by splitting the APT, its prediction for both Y_1 and Y_2 is improved. It becomes clear there is a component of APT which can positively predict the performance in faculty of medicine. This being the VOC component. The results here also show that those who did well in ABST component of APT were doing badly in the university examinations

The optimum prediction for Y_1 could be achieved by considering the set ALEV, OLEV, VOC and MATHS. For Y_2 the set ALEV, OLEV, VOC, MATHS and NUMER gives the optimum prediction.

Tables showing statistical data with each criterion variable for architecture students' sample:-

Table XII: 1 CRITERION: Y_1 N=86

Variables	Weights	t-stat	Part. Corr	Mult. Corr.
CONST	52.75			
MATHS	- .70	.63	- .07	.19
ENG	.78	.79	.09	.18
OLEV	- .28	.78	- .09	.18
ALEV	.60	1.09	.12	.16
APT	- .02	.11	- .01	.20

MULT CORR .20

Table XII. 2 CRITERION Y_2 N=86

CONST	41.69			
MATHS	- .03	.06	-.01	.40*
ENG	- .09	.23	-.03	.40*
OLEV	- .02	.17	-.02	.40*
ALEV	.78	3.63**	.38	.14
APT	.09	1.20	.13	.38*

MULT CORR .40*

Table XII. 3 CRITERION: Y_3 N=86

CONST	50.46			
MATHS	- .07	.06	-.01	.32
ENG	- .78	.81	-.09	.31
OLEV	- .20	.58	-.06	.32
ALEV	1.36	2.53*	.27	.18
APT	- .08	.46	-.05	.32

MULT CORR .32

The following are the deductions we can make from the three tables (Tables XII.i):-

ALEV has positive regression weights with all the three criterion variables Y_1, Y_2 and Y_3 and in particular two are significantly different from zero and these are the ones with Y_2 and Y_3.

Hence the conclusion is, ALEV predicted the performance of university examination in second and third year in faculty of architecture.

With Y_2 as a criterion, multiple correlation coefficients significantly different from zero are obtained.

For this sample, there are interesting linear combinations of the predictor variables with Y_2. Three sets of predictors form a least square linear combinations with Y_2 which yield same multiple correlation coefficient. Here are sets of 4

predictors listed in their descending order of their predictive efficiency. There is tying up of the 3 sets of predictors as far as their multiple correlation coefficients with Y_2 are concerned.

1. MATHS,ENG,APT,OLEV
   MATHS,OLEV,APT,ALEV
   ENG,APT,OLEV,ALEV

4. MATHS,ENG,OLEV,ALEV

The linear combination of MATHS, ENG, APT and OLEV (i.e. excluding ALEV) with Y_2 has coefficient not significant. ALEV is the best single predictor for performance in second year university examination in faculty of architecture, and excluding it from the set of predictors yields a coefficient significantly different from zero. The next best single predictor of Y_2 is aptitude test. Excluding it from the predictors' set will yield a multiple correlation coefficient not significantly different from zero. Since, for obvious reasons, those tests that are good predictors should be used for selection purposes, this would mean a selection device for students into faculty of architecture which uses any four of the five predictors and neglects A-level would be inappropriate. The partial correlations between the same criterion and aptitude test are both positive and relatively high, hence a selection device which would use both would come up with candidates who have a higher chance of succeeding in this course, (second year examinations

in faculty of architecture) than other candidates selected using any other two predictors among those considered.

The results obtained with architecture students' sample when the three components of aptitude test were considered were as follows:-

Tables showing statistical data for architecture students' sample:-

Table XIII. 1 CRITERION: Y_1 N=86

Variables	Weight	t-stat.	Part. Corr	Mult Corr
CONST	51.27			
MATHS	- 1.17	1.15	- .13	.12
ENG	0.35	.44	.05	.17
OLEV	- .02	.08	- .01	.17
ALEV	.37	.69	.08	.16
VOC	- .07	.21	- .02	.17
NUMER	- .07	.21	- .02	.17
ABST	.12	.12	.01	.17

Table XIII. 2 CRITERION: Y_2 N=86

CONST	37.52			
MATHS	- 0.63	1.27	- .14	.53*
ENG	- .96	2.48*	- .27	.49*
OLEV	.43	3.96**	.41	.39*
ALEV	.69	2.68*	.29	.48*
VOC	.02	.11	.01	.54*
NUMER	- .26	1.57	- .17	.52*
ABST	.64	1.30	.15	.53*

MULT CORR. 0.54*

Table XIII. 3 CRITERION: Y_3 N=86

CONST	36.34			
MATHS	- 1.23	.53	- .06	.27
ENG	- 1.23	1.29	- .14	.24
OLEV	.16	.60	.07	.27
ALEV	1.10	1.72	.19	.21
VOC	.47	1.10	.12	.25
NUMER	- .56	1.39	- .15	.23
ABST	1.01	.83	.09	.26

MULT CORR. 0.28

For architecture students the result show that the regression weights with values significantly different from zero are the following:-

ENG, OLEV and ALEV with Y_2.

The regression weights associated with ENG in this case is negative implying those who do well in ENG tend to do badly in second year architecture examinations. For optimum prediction for Y_2 and Y_3 the set to be taken is OLEV, ALEV, ABST and VOC. Hence showing also by considering the components of the APT, prediction is slightly improved.

The following are the results obtained with the Agriculture students' sample:-

Tables showing statistical data for the Agriculture students' sample:

Table XIV. 1 CRITERION: Y_1 N=29

Variable	Weight	t-stat	Part. Corr	Mult Corr
CONST	41.91			
MATHS	.65	.73	.15	.52
ENG	.56	.74	.15	.52
OLEV	- .28	1.28	- .26	.48
ALEV	- .03	.10	- .02	.53
APT	.36	2.18*	.41	.37

MULT CORR. .53

Table XIV. 2 CRITERION: Y_2

CONST	46.62			
MATHS	- .11	.11	- .02	.38
ENG	.78	.95	.19	.33
OLEV	- .19	.79	- .16	.34
ALEV	- .23	.69	- .14	.35
APT	.25	1.35	.27	.27

MULT CORR .38

Table XIV: 3 CRITERION: Y_3 N=29

CONST	43.01			
MATHS	.22	.26	.05	.53
ENG	.61	0.87	.10	.51
OLEV	- .24	1.17	- .24	.49
ALEV	- .14	.46	- .10	.53
APT	.37	2.39*	.45	.32

MULT CORR .53

The following deductions can be made using the three tables:-

APT has positive regression weights with the criterion variables Y_1, Y_2 and Y_3 and in particular two of these are significantly different from zero. These are the weights with Y_1 and Y_3.
None of the multiple correlation coefficients is significantly different from zero.

Clearly APT turned out as the best single predictor for the performance in faculty of Agriculture.

OLEV and ALEV give negative regression weights with all the three criterion variables Y_1, Y_2 and Y_3. This is interesting though none of the weights is significantly different from zero.

Possibly in faculty of Agriculture examinations tend to test very different abilities as compared to the abilities

tested by ALEV and OLEV. Hence it is very sensible to ask why use ALEV or OLEV for selection or placement into faculty of agriculture, while results show that different abilities are required for sucess in that faculty?

The following are the results obtained with the Arts Students' sample:-

Table XV. 1 CRITERION: Y_1 N=23

Variables	Weight	t-stat	Part Corr	Mult Corr
CONST	42.18			
MATHS	1.31	.84	.20	.60
ENG	.47	.26	.06	.62
OLEV	.18	.39	.09	.61
ALEV	.87	1.28	.30	.57
APT	- .40	.95	- .22	.59

MULT CORR .62

Table XV. 2 CRITERION: Y_2 N=23

CONST	52.37			
MATHS	.39	.30	.07	.40
ENG	2.07	1.34	.31	.28
OLEV	- .48	1.18	- .27	.31
ALEV	.51	.89	.21	.36
APT	- .07	.19	- .05	.41

MULT CORR .41

Table XV: 3 CRITERION: Y_3 N=23

CONST	46.82			
MATHS	- .51	.43	- .10	.49
ENG	2.24	1.62	.36	.37
OLEV	- .49	1.37	- .32	.41
ALEV	.62	1.21	.28	.43
APT	.04	.12	.03	.50

MULT CORR 0.50

The following deductions can be made using the three tables for Art students' sample:-

ENG and ALEV have positive regression weights with all the three criterion variables, Y_1, Y_2 and Y_3. None of these weights is significant but all the same are interesting. Also none of multiple correlatiom coefficients are significant.

Here the Art sample was quite small, possibly this is why we tend to have no set of predictors or any one predictor which predicts the performance in this faculty.

Here are the results obtained with the male students of the whole sample:-

Tables showing statistical data for the male sample:-

Table XVI. 1 CRITERION: Y_1 N=225

Variable	Weights	t-stat	Part Corr	Mult Corr
CONST	42.47			
MATHS	- .22	.44	-.03	.13

TABLE XVI. 1 (CONT.)

ENG	.05	.09	.01	.14
OLEV	.06	.39	.03	.13
ALEV	.36	1.30	.09	.10
APT	.03	.33	.02	.13

MULT CORR .14

Table XVI. 2 CRITERION: Y_2 N=225

CONST	43.07			
MATHS	- .05	.14	- .01	.21*
ENG	.11	.26	.02	.21*
OLEV	.00	.01	.00	.21*
ALEV	.50	2.46*	.16	.14
APT	.05	.76	.05	.21*

MULT CORR .21*

Table XVI. 3 CRITERION: Y_3 N=225

Variables	Weight	t-stat	Part Corr	Mult Corr
CONST	46.62			
MATHS	- 1.05	1.38	- .09	.14
ENG	- 1.17	1.42	- .10	.14
OLEV	.16	.68	.05	.17
ALEV	- .15	.37	- .02	.17
APT	.08	.54	.04	.16

MULT CORR .17

A similar kind of results as obtained with architecture students' sample presplitting of APT, seem to show with

this sample (male sample) in relation to the Y_2 where we have significant results. The pattern of the descending order of predictive efficiency is very much like the one for architecture sample. The same tying up has been shown by the multiple correlation coefficients of the linear combinations of the three sets of predictors:-

ENG,OLEV,ALEV,APT

MATHS,OLEV,ALEV,APT

ENG,MATHS,ALEV,APT.

All these three sets give a linear combinations with a multiple correlation coefficient of 0.21(3) with Y_2 which is significantly different from zero. The set of 4 predictors formed by excluding ALEV from the regression set gives rise to a linear combination which has a coefficient with Y_2 that is not significant. Hence an anologous argument like one given earlier for architecture sample can be invoked here too.

With third year university examination performance, Y_3, we seem not to have any linear combination of predictors which has a multiple correlation coefficient significantly different from zero at 0.05 level. But it might be remembered that there were t-statistics even partial correlations which were significant. Hence for Y_3 it seems as if there is no set of four of five predictors of which considered, which will give a linear combination with a coefficient significantly different from zero. Here it

was not considered sets with less than four predictors. We have reasons to believe that with sets with less than four predictors, we can get linear combinations with multiple correlation coefficients significantly different from zero at 0.05 level.

OPTIMUM PREDICTION FOR SAMPLES WITH SIGNIFICANT RESULTS

By utilising the partial correlation we can decide whether by adding a certain predictor in the predictor set we improve the prediction or not. For instance take faculty of Medicine and considering first year university examination performance as criterion, we observe ALEV is the best single predictor. This has a partial correlation of 0.54 with the criterion variable. The next best predictor here is OLEV, this also has a positive partial correlation with the criterion variable 0.46 hence we are sure then by considering both OLEV and ALEV for prediction purpose we are in better shape than when we consider any one of them separately. The prediction is just slightly improved by adding English language (ENG) in the prediction set. This is because partial correlation of English language with criterion is only 0.01. Hence for medical students we have a set of the 3 predictors namely ALEV, OLEV and ENG which give optimum prediction. That is this group of predictors is more efficient as a predictor of criterion than the best single predictor. We find a similar result when we take second year performance as a

as a criterion for the same sample. In other words OLEV, ALEV and ENG as a group is also a more efficient as a predictor of second year performance than the best single predictor, ALEV.

For Education student and taking Y_1 as a criterion we find APT is the best single predictor, this has a partial correlation of 0.22 with this criterion. The next best single predictor is English language but this has a partial correlation which is negative -.17 hence by considering this together with Aptitude test the predictive efficiency is certainly lowed, for Education sample. Hence for faculty of Education sample the set which is more efficient as a predictor for Y_1 is APT, OLEV and MATHS. When components of Aptitude test are considered, the set is VOC, MATHS, OLEV and ABST as found earlier.

For faculty of architecture the set which gives optimum prediction for Y_2 is OLEV, ALEV and APT. When the components of APT are considered then the set is ALEV, OLEV, ABST and VOC. Showing the numeric component (NUMER) of aptitude test is not important for prediction purposes in this particular sample.

The above decisions were reached by looking at multiple correlation coefficients which are significantly different from zero and utilising the corresponding partial correlations. Similar decisions can be reached even in cases in which non-significant coefficients are found.

Summary of Multiple regression results:-

A-Level seems to have an appreciable predictive efficiency for the university examinations in two faculties:-

1. Architecture during second and third year.
2. Medicine in both first and second year.

O-level has predictive efficiency in faculty of Medicine during first year. The aptitude test score has a predictive efficiency in the faculty of:-

1. Agriculture during first and third year.
2. Education in first year.

Splitting the Aptitude test improves the predictive efficiency of Aptitude test. Vocabulary, a component of the Aptitude test, has a high predictive efficiency in most faculties. It is no wonder to find that students having better vocabulary score higher at the university since vocabulary plays an important role in most of university courses.

For the faculty of Medicine the study showed that the set consisting of O-level, A-level and English language is more efficient as a predictor of first and second year examination performances than the A-level itself.

For Architecture the optimum prediction can be achieved by considering A-level, O-level and Aptitude test when second year performance is taken as a criterion. The optimum prediction can be achieved by considering aptitude test, O-level and Mathematics for faculty of Education taking first year performance as a criterion.

Using the sets of predictor variables found to give optimum prediction for selection purposes would result in getting the candidates who have a higher chance of succeeding than other candidates selected using one or the other

combinations of the predictor variables. For example a selection device into faculty of Education which uses the Aptitude test, O-level and Mathematics would come up with candidates who are most likely to finish successfully in Education than other candidates selected using for instance A-level and O-level.

Clearly, judging from the findings of this study, it is most inappropriate to use a selection device like A-level only which correlates so unsuitably with criteria in most faculties considered. Bearing in mind the shortcomings of the study, the suggestion is A-level grades should not be used alone for admission of freshers into the university. Most important it should not be used alone for placing candidates into faculties.

CANONICAL ANALYSIS

Canonical correlation Analysis for the whole sample:-

Table: XVII Showing Bartlett's Chisquare tests of successive eigenvalues for the whole sample:-

eigenvalue	Corresponding canonical correlation	chisquare	degrees of freedom (df)	probability
0.074	.27	22.91	15	.09
0.008	.09	2.63	8	.95
0.002	.04	.51	3	.91

From Table XVII, Table of tests of successive eigenvalues none of the eigenvalues is significant although the first one is only just short of significance. Also from the table it

can be deduced that the set of the five predictor variables can predict the linear combination of Y_1,Y_2 and Y_3 with about 90 per cent confidence for the whole sample.

The other two eigenvalues provide canonical correlation coefficients which are not significant at all as evident from the probabilty given. The probability given is the chance that the canonical correlation coefficients can be obtained from random data. If a canonical correlation coefficient is significant, the weights associated with each predictor and each criterion are considered in the manner described in Chapter III.

The obvious question to ask is what contributes to the prediction and to what extend does it do it? To answer the foregoing question, the weights associated with each significant canonical correlation coefficients have to be considered. These weights have to be considered to find out what meaningful psychological interpretation can be made. The following are the weights obtained for each canonical correlation coefficient of the whole sample:-

Tables showing weights of each canonical correlation coefficient :-

Table XVIII. 1 Canonical Correlation 0.27

Weights of Predictors		Weights of Criteria	
MATHS	.47	Y_1	.14
ENG	.53	Y_2	.91
APT	.06	Y_3	-.96
OLEV	-.37		
ALEV	.69		

Table XVIII. 2 Canonical Correlation .09

MATHS	- .53	Y_1	1.13
ENG	-1.34	Y_2	- .54
APT	.51	Y_3	.29
OLEV	1.71		
ALEV	- .15		

Table XVIII. 3 Canonical Correlation .04

MATHS	-.32	Y_1	-.41
ENG	-.10	Y_2	.79
APT	.71	Y_3	.54
OLEV	-.75		
ALEV	.73		

Looking at the weights associated with first canonical correlation, it is clear that there is no linear combination of the criterion variables which can be called university success. The linear combination is heavily and positively loaded on Y_2 and heavily and negatively loaded on Y_3. Hence no meaningful psychological interpretation can be made of these weights.

Any conclusions which can be made using the weights here will be similar to the conclusions reached using results of multiple regression. In other words, to a lesser degree the canonical correlation has not improved the prediction as was anticipated. It was anticipated that a linear combination with suitable loading on each criterion variable was to be obtained. This was not so.

Though there was evidence in the study earlier to support the consistency in measurement and grading in university examinations, from the findings here we were not able to identify a linear combination of Y_1, Y_2 and Y_3 which would be reffered to as university success.

The following were the results obtained with Education students' sample when a canonical correlation analysis was done:-

Table XIX: Showing Bartlett's Chisquare tests of successive eigenvalue for the Education students' sample:-

Eigenvalue	Canonical R	Chisquare	df	Probability
.160	.40	19.36	15	.20
.013	.11	.98	8	.99
.004	.06	.99	3	.94

From the above table, Table XIX none of the eigenvalues is significant, hence the set of five predictor variables failed to correlate with the linear combination of Y_1, Y_2 and Y_3. The following were the weights associated with first canonical correlation.

Table XX: Showing the weights of first Canonical Correlation of Education students' sample:-

Weights of predictors		Weights of criteria	
MATH	.21	Y_1	.87
ENG	-.77	Y_2	-.96
APT	.54	Y_3	.91
OLEV	.93		
ALEV	-.57		

Though the canonical correlation coefficient associated with weights on table XX is not significant it is interesting to look at the weights. From the weights of the criterion variable it is apparent that the linear combination here cannot be called "university success." It is loaded positively on Y_1 and Y_3 and negatively on Y_2.

The following were the results obtained with medical students' sample before the components of APT were considered. Discussion on which the components of APT are considered comes later.

Table XXI Showing Bartlett's Chisquare tests of successive eigenvalue for the medical students' sample:-

Eigenvalue	Canonical R	Chisquare	df	Probability
0.77	0.88	27.22	10	.002
.05	.22	.88	4	.93

The probability that the kind of data in this case should occur randomly is quite low 0.002, hence prediction is most definite here i.e. the set of the five predictor variables predicted the university performance combination of Y_1 and Y_2 in faculty of medicine very satisfactorily. Of the two canonical correlation coefficients it is only one of them which is significantly different from zero. Below here is a table of weights as obtained for this coefficient.

Table XXII: Showing weights of first canonical correlation of medical students' sample:

Weights of predictors		Weights of criteria
MATHS	-.09	

TABLE XXII (CONT.)

ENG	-.00	Y_1	1.15
APT	-.09	Y_2	- .18
OLEV	.79		
ALEV	.40		

Here the deduction which can be made is we do not have what we can call "university success" since there is only appreciable positive loading on Y_1; and negative relatively low one on Y_2.

The following were the results obtained with 7 predictor variables i.e. when the components of APT are included in the predictor set instead of APT itself for medical students' sample:-

Table XXIII: Showing Bartlett's Chisquare tests of successive eigenvalues:-

eigenvalues	Canonical R	Chisquare	df	Probability
.81	.90	32.14	14	.004
.18	.43	3.41	6	.75

The results show the set of seven predictor variables could predict the university performance combination of Y_1 and Y_2 quite satisfactorily. The following are the weights associated with canonical correlation coefficient which was found to be significant.

Table XXIV: Showing weights of first canonical correlation coefficient:-

Weights of predictors		Weights of criteria	
MATHS	.13		
ENG	-.08	Y_1	.94
OLEV	.67	Y_2	.07

TABLE XXIV (CONT.)

ALEV	.28
VOC	.34
NUMER	-.05
ABST	-.61

A similar deduction as made earlier can be made here that the linear combination of Y_1, and Y_2 can not be referred to as university success.

The success in faculty of medicine was predicted quite well by the set of the five predictors. Hence there seem not to be much difference in the two predictions of success, as done by 5 predictors and by 7 predictors.

The following were the results obtained with architecture students' sample. First considering APT with other predictor variables and then later considering the components of APT instead of APT itself.

TABLE XXV: BARTLETT'S CHISQUARED TESTS:

(Architecture students' sample)

eigenvalues	Canonical R	Chisquare	Df	Probability
.16	.40	23.87	15	.07
.09	.30	9.85	8	.28
.03	.17	2.28	3	.52

The results show that the combination of Y_1, Y_2 and Y_3 in faculty of architecture could be predicted at .07 level of significance by the set of five predictor variables. The weights obtained for the first two canonical correlations were as given:-

Tables showing weights of each canonical correlation coefficient for architecture students' sample:-

Table XXVI. 1 Canonical correlation .40

Weights of predictors		Weights of criteria	
MATHS	.01	Y_1	- .15
ENG	- .14	Y_2	1.03
APT	.34	Y_3	.02
OLEV	- .03		
ALEV	1.00		

Table XXVI. 2 Canonical Correlation .30

MATHS	- .15	Y_1	.43
ENG	- .20	Y_2	- .63
APT	- .48	Y_3	1.08
OLEV	- .56		
ALEV	.37		

The weights here of the criterion variables do not provide a linear combination which can be termed 'university success.' Hence trying to make any conclusions using these these weight, we shall reach to the same conclusions as reached using multiple regression analysis.

The following were the results obtained with the seven predictor variable for the same sample, the architecture students' sample

Table XXVII: Showing Bartlett's Chisquared tests.

(Architecture students' sample)

eigenvalue	canonical R	chisquare	df	probability
.31	.56	35.70	21	.02
.05	.22	5.69	12	.93
.02	.14	1.71	5	.89

Clearly the set of seven predictor variables predicted (at .02 level of significance) the success in the faculty of architecture. The first canonical correlation coefficient is the only one significant and the following are the weights associated with it.

Table XXVIII: Showing the weights of first canonical correlation:

Weights of predictors		Weights of criteria	
MATHS	-.20		
ENG	-.54	Y_1	-.26
OLEV	.97	Y_2	1.01
ALEV	.48	Y_3	.07
VOC	.05		
NUMER	- .38		
ABST	.31		

No 'university success' has been provided by the set of criterion variables. The university performance combination of Y_1, Y_2 and Y_3 is positively loaded on Y_2. Hence, here, university performance is essentially a component of Y_2.

By considering the set of 7 predictors instead of five the prediction of success was certainly improved for architecture students' sample.

The following were the results obtained in the analysis for Agriculture students' sample:

Table: XXIX:- BARTLETT'S CHISQUARED TESTS (Agriculture Students' sample)

eigenvalue	canonical R	Chisquare	df	probability
.35	0.59	12.32	15	.66
.09	0.29	2.24	8	.97
.01	0.08	0.14	3	.98

All the canonical correlation coefficients are not significant at any appreciable levels of significance. Hence the set of five predictor variables did not predict well the university success in faculty of Agriculture. Since there is no canonical correlation which is significantly different from zero the weights are not considered here.

Clearly, the abilities tested by examinations in faculty of Agriculture seem to be different abilities from those tested by ALEV, OLEV and APT. For if there were the same abilities then at least one canonical correlation coefficient could have been significant.

The following were the results obtained with Art students' sample:-

Table XXX: Bartlett's Chisquared tests (Art Students' sample:-)

eigenvalue	canonical R	Chisquare	df	Probability
.56	.74	19.72	15	.18
.26	.51	5.55	8	.70
.02	.21	.26	3	.96

The first canonical correlation coefficient is only significant at 0.18 level. This implied that the set of five predictors could predict success for Art students' sample with about 80 per cent confidence. The following were the weights associated with this canonical correlation coefficient.

Table XXXI: Showing the weights of first canonical correlation:

Weights of predictors		Weights of criteria	
MATHS	.30	Y_1	1.28
ENG	- .64	Y_2	- .77
APT	- .36	Y_3	- .20
OLEV	1.13		
ALEV	.19		

The weights of criterion variable show that the linear combination of criterion variables can not be termed 'university success.' University performance here is a factor primarily defined by Y_1.

General Discussion on Canonical Correlation analysis:-

Looking at the weights associated with each canonical correlation coefficient it was clear that there was no sample

in which a primary criterion which can be termed 'university success' was found. In other words, no single factor consisting of linear combination of criterion variable with suitable weights was identified. This factor is the one termed here university success. However, we know that there were linear combinations of criterion variables with significant canonical correlation coefficient with the linear combinations of predictor variables for some samples.

The success given by linear combination of the 3 criterion variables has a highest canonical correlation coefficient of 0.27, for the whole sample, with the linear combination of the 5 predictor variables. This canonical correlation coefficient is significant at a level of 0.09. This implies the set of five predictor variables could predict the success for the whole sample with about 90 per cent confidence.

The analysis of canonical correlation did not improve predictions for Agriculture students' sample. None of the weights of the three canonical correlation coefficients was considered, simply because there was no linear combinations of the predictors which correlated significantly with what was termed success.

The level of significance was 0.07 for the architecture students' sample implying the coefficient 0.60 is significantly different from zero at 0.07 level of significance. The single score given by the linear combination of the predictors correlated significantly with the university performances at

0.07 level for this particular sample. Hence the linear combination of the 5 predictors predicted the success for architecture students' sample with about 93 per cent confidence. The linear combination of 7 predictors (APT components considered instead of APT) had an improved prediction for the success for this sample.

Possibly among the samples considered, the canonical analysis proved most successful for the sample from the faculty of medicine. The canonical correlation obtained for the linear combination of 5 predictors and the linear combination of criteria (university examinations performances) was 0.88 and this is significantly different from zero even at low level as 0.002. Hence the linear combination of the 5 predictors seemed to predict the success very well for the medical students' sample. With a linear combination of 7 predictors the prediction was not very much different from that of set of 5 predictors.

For Art and Education samples the canonical correlation coefficients were only significantly different from zero at 0.20 level implying the linear combinations of the 5 predictor variables did not suitably predict success in these two samples as it did for medicine students' samples.

Possibly some other study can be planned to find out whether by considering fewer particular predictors, fewer than 5, one can be able to improve the prediction. In other words, someone can set out to find out whether there is a set

of four, three or two predictors (among the 5 or the 7) which can predict university success.

Summary and implications:-

For medical students' sample it seemed that the linear combination of 5 predictor variables yielded quite high predictive validity (canonical correlation coefficient) with university examinations performances. The success for medical students' sample could be predicted with greater accuracy than that of other subjects from other faculties; followed by Architecture sample, Arts sample, Education sample and lastly Agriculture students' sample.

Validation study can be planned using students who graduated earlier or at later date. If the results of cross validation study show there is similarity in the predictive validities of each sample considered in cross validation study and those in this main study then there is no reasons why the implications of the study cannot be extended to the population. Hence the suggestion is a lot of weight should not be put on these findings not until a cross validation study is done for no one is sure whether the findings are only true for the samples under the consideration or otherwise. However there are reasons to believe there is no uniqueness in the samples used.

The Art sample was small compared to the whole population of the faculty of Arts. For others the samples taken represented well over half the population. So it is not reasonable to extend

findings to whole faculty of Arts for there is likehood of this sample being unique.

There is evidence in the study to support the consistency in measurement and grading practices with university. The canonical correlation analysis brings out that in all cases there is no linear combination of Y_1,Y_2 and Y_3 which can be referred to as university success. If there existed such linear combinations of Y_1,Y_2 and Y_3 then criteria Y_1,Y_2 and Y_3 would have had almost identical weights.

A-level exhibits satisfactory measurement characteristics on most counts and excellent ones on a few. However the evidence in the study does not lend strong support to use of A-level alone for selection to the university when university examination performances are the criterion variables. Since every candidate must pass the university examinations for she or he to be awarded a degree then it is obvious, there is no need to question the desirability of the use of university examination performances as criteria.

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