Predicting Success in Business Data Processing for Students Enrolling in a College Data Processing Program

Stuart James Travis
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PREDICTING SUCCESS IN BUSINESS DATA PROCESSING FOR STUDENTS
ENROLLING IN A COLLEGE DATA PROCESSING PROGRAM

by

Stuart James Travis

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Education
Department of Educational Leadership

Western Michigan University
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The purpose of this investigation was to develop a method for predicting success of students in a B.S. data processing program and data career success in data processing for those graduates.

Data were collected from Ferris State College records for high school rank, SCAT verbal and quantitative scores, all college GPA, data processing GPA, English GPA and sex. An instrument was developed to collect data from graduates' supervisors to measure career success. Multiple regression and correlation analysis, t-test for independent means and the chi square test for independence were employed. The sample population consisted of 271 students who enrolled in Ferris' B.S. program in data processing during the years 1972, 1973 and 1974. The 271 students consisted of 125 graduates and 146 dropouts.

The following conclusions were drawn as a result of this investigation:

Research Hypothesis I stated that high school academic performance will be found to be a reliable predictor of academic performance in Ferris State College's B.S. data processing program. Data from this study supported this position.

Research Hypothesis II stated that sex will be found to be a reliable predictor of academic performance in Ferris State College's B.S. data processing program. The data analysis did not support this position.
Research Hypothesis III stated that sex will be found a reliable predictor of data processing career success. The data analysis did not support this position.

Research Hypothesis IV stated that high school and college academic performance will be found to be a reliable predictor of dropout or persistence in Ferris' B.S. data processing program. The data analysis supported this position.

Research Hypothesis V stated that high school and college academic performance will be found to be correlated with career success for graduates of Ferris' B.S. data processing program. The data did not support this position.

Therefore, it is possible to utilize high school and college academic performance data and aptitude tests for guidance and counseling information to help students make academic program decisions about data processing. However, it is not possible to use these data to predict success in a data career.
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Stuart James Travis
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CHAPTER I

INTRODUCTION

Introduction to the Problem

Data Processing as a career is quite new, developing over the last fifteen or twenty years. It is a career field that is growing very rapidly with the number of job openings generally exceeding the supply of trained personnel. Because of its association with the computer, data processing is currently very popular and has glamour qualities that appeal to an ever growing number of college freshmen making career decisions.

In general, college freshmen making career decisions have little information, or some conception of what appears to be the "thing to do." This can result in serious problems for the students. Since many of them do not really understand what a data processing career choice entails and offers as an end result, they often become disillusioned or get into academic trouble, changing curriculums or dropping out of college. This results in tremendous costs in time and money to these students and is also very costly to institutions of higher education. As a result, college and university resources might better be utilized by helping students make better career choices earlier through better career counseling.

This study was conducted at Ferris State College which is a four-year state supported institution with a state mandated role of serving as an opportunity college with an open door policy similar.
to the community college admissions model. This means that students with minimal requirements, generally a high school diploma, can be admitted to Ferris. From there, admission to the data processing curriculum requires only a grade point average (GPA) of 2.00 (C) out of 4.00 (A) for admission as a major. If the student is being admitted with no college credits earned they are required to have a high school GPA of 2.00. If the student is being admitted with accumulated college credits they are required to have a college GPA of 2.00. This criterion is not likely to change since Ferris, in keeping with the spirit of their role statement, wants to provide everyone possible with the opportunity to explore data processing as a career choice.

Since Ferris State College School of Business Dean's Office student records indicate approximately 75% of data processing students fail to matriculate, it is highly desirable to provide students with better information with which to make career decisions prior to committing valuable resources to this specific career choice. Acquiring this information in order to provide the enrolling college freshman with well-documented data processing career counseling information is one of the primary problems.

Statement of the Problem

The problem to be addressed is two fold. The first is how to obtain information that can be used to predict a student's chances of success in Ferris State College's Data Processing Program and provide the college counselors with information they can use to further develop the counseling program. The second is how to determine the common
characteristics of data processing graduates who have achieved career success. Characteristics, such as grades received in various college courses, high school rank, School and College Ability Tests (SCAT), and sex will be considered. By determining characteristics that successful data processing graduates have in common, a profile can be established for use by college advisors and counselors to provide prospective and current students with information needed for career decisions and academic program planning.

Rationale for the Study

Ferris State College, as an open door institution, has a responsibility to provide students with as much information and guidance as possible in making appropriate career choices in line with students' interests, goals, and aptitudes. It serves no purpose to society or the students to have them enroll and then fail or drop out because of inadequate, inappropriate or nonexistent direction. This is a major reason for developing a success prediction model.

It is predicted that due to declining birth rates colleges will have major enrollment declines by the mid 1980's. This enrollment decline is already in evidence in numerous higher educational institutions. Enrollments can be maintained or even increased if students can be counseled into appropriate career choices as an alternative to an initial failure which often precipitates dropping out of college.

This predictive information has another important use in a declining enrollment environment. If there are common, measurable characteristics of a successful data processor such as high school grades,
School and College Ability Test (SCAT) scores, and sex, the study results will be able to define target populations of potential students for recruiting efforts. As enrollments decline, the recruiting efforts of higher educational institutions are going to become very intense, having already increased substantially in many institutions. For optimum return on recruiting investment, it is desirable to recruit students for career areas in which they are likely to have an aptitude and best chance of success. This would result in substantially reduced attrition rates and would greatly improve the learning environment of the classroom.

The second phase of the study, developing a profile as determined by sex of data processing graduates that have achieved career success, is important for several reasons. If counselors had this kind of profile information, prospective students and students in the early stages of their data processing curriculum would be able to make career decisions at earlier stages. This could result in significant time and cost savings to students and the college.

Purpose

The purpose of the study was to identify and examine characteristics of Ferris State College Data Processing graduates who had achieved success in their data processing careers and to develop a model to predict likelihood of success of future students aspiring to data processing careers. The objectives of the study were:

1. To determine if high school rank, SCAT test scores, college grades and sex could be used to predict success in Ferris' Data
Processing program.

2. To determine if high school rank, SCAT test scores, college grades and sex could be used to predict career success.

3. To provide information that can be used by Ferris State College's Counselors, advisors, and faculty to design strategies for recruiting students with the greatest probability of achieving success in Ferris' Data Processing program and in a data processing career.

Limitations of the Study

This study was limited to Ferris State College's Data Processing curriculum and any conclusions reached must be limited to the specific population in the study. However, the researcher would like to emphasize that the intention was to make the nature of the problem the focus rather than the geographic location of the College.

In the data collection, the researcher depended upon the accuracy of the student records and the cooperation of the supervisors of the Data Processing Alumni in accurately completing the Skills and Knowledge Assessment instrument.

Significance of the Study

The importance of research related to predicting academic success and career success in data processing is demonstrated by the role it plays in today's business community and the larger society. Data processing as a discipline and the people who make up the data processing population are in the news today for a great variety of reasons. From computer related crime to invasion of citizen privacy to the major
impact computers have on business and society, data processing professionals are having a tremendous impact on the way we live and do business. This impact is predicted to accelerate at an extremely fast rate over the next ten to twenty years. Therefore, it is imperative that colleges and universities provide data processing graduates that have all the attributes and qualities necessary to achieve career success. This should result in reduced mismanagement and waste of resources. Crime related to computers should be reduced resulting in more efficient use of data processing in the business environment. By identifying characteristics of successful data processing graduates, colleges will be better able to produce people with the qualities necessary for making the greatest contribution to the data processing profession.

Another major concern that this study can help to address is the need to reduce waste of college and university resources and the resulting waste of the student's academic and career life. This waste results when students get into academic programs where they have very little probability of success. They soon develop academic problems and fail or change curriculums.

The need to reduce attrition is a critical problem in many colleges and universities. Educational programs need to be cost effective because with today's increased emphasis on accountability and dwindling educational resources, curricula with high attrition rates and resulting high costs will be the first programs phased out or severely curtailed.

By identifying students likely to be successful, the students
likely to drop out are also identified. This means that information resulting from this study can be used to counsel potential dropouts into other programs where success is more likely. Furthermore, borderline students can be helped with special programs so they are more likely to achieve success.

Another significant result of this study will be the college's ability to use the findings to design more effective recruiting strategies. By recruiting students with more potential of success to specific programs, attrition reduction should result in improved curriculum cost effectiveness.

Organization of the Remainder of the Study

Chapter II of this study reviews doctoral and other research studies which relate directly to the topic of prediction of college success as measured by college graduation. First general prediction studies which look at overall college success are reviewed. Then studies which pertain to success in data processing college programs are examined. Next studies which deal with high school and college performance as a predictor of college success are reviewed. Finally, studies and research that pertain to graduate followup studies in both data processing and other career areas are reviewed.

Chapter III presents in detail the methodology used in the study. Included are sections on the research hypotheses, the study population, instrumentation used to collect data, general study procedures, statistical procedures, independent and dependent variables, data classification, data collection and statistical assumptions.
The findings of the study are presented in Chapter IV.

Chapter V contains the conclusions and recommendations resulting from the study. Appendices are included giving details on Ferris' data processing program, graduate follow-up pilot study and data analysis results.
CHAPTER II

REVIEW OF RELATED LITERATURE

Review of Prediction Studies

There have been numerous prediction studies, perhaps thousands, conducted to predict academic success in colleges and universities (Astin, 1971). The early prediction studies used primarily intellectual factors such as high school grades, high school class rank, and aptitude scores (May, 1923; Crawford & Burnham, 1946; Fishman & Pascarella, 1960; Lavin, 1965). It is generally accepted by researchers that intellectual factors such as high school grades and aptitude tests account for one-quarter to one-half of the variance in academic success (Lavin, 1965; Khan, 1969; Price & Kim, 1976). The evidence overwhelmingly supports the fact that high school grades are the single best predictor of academic success in college (Astin, 1971). Aptitude tests such as the American College Test (ACT) are probably second best predictors of college GPA and contain information that would make the college GPA prediction more accurate than only using high school grades (Astin, 1971).

Types of Prediction Studies

There are several kinds of studies that use ability measures to predict college academic performance (Lavin, 1965). Lavin (1965) indicates that studies in which a battery of predictors is used to predict
a global measure of academic performance such as overall grade point average provide a higher magnitude of prediction than do studies using global ability measures. Lavin (1965) is in agreement with Astin (1971) in his conclusion that high school grades are the best single predictor of college performance in studies using a battery of ability measures.

Another approach to prediction studies is presented by Lavin (1965) and is called the differential prediction technique. This approach uses several measures of ability to predict grades or success in specific courses or curricula. This type of study is of practical importance because of the specialized nature of our occupational system where people select specialized occupations requiring special abilities. Differential prediction can be used to isolate those subjects in which students perform well, but global prediction cannot accomplish this (Lavin, 1965; Fishman & Pasanella, 1960).

This study is a combination of the global and differential prediction models, since both success in the data processing curricula and the overall college success is being predicted.

Very few studies using batteries of predictors present data on sex differences (Lavin, 1965). Research provides evidence that college performance would be different by sex with females tending to be more predictable than males in academic performance (Lavin, 1965; Corlett, 1974). A study conducted by Worthington and Grant (1971) provides evidence that sex has enough influence on college grades to warrant further study.
Independent Variables—Academic Prediction Studies

High School GPA and Class Rank

The literature overwhelmingly supports the use of high school grades and rank in high school class as among the best predictors of college performance. Lavin (1965), Khan (1969), and Price and Kim (1976) find that intellective factors, such as high school grades and aptitude tests account for one-quarter to one-half of the variance in predicting college academic success. Lavin (1965) and Astin (1971) agree that high school grades are the best single predictor of college academic performance in studies using a battery of ability measures. Price and Kim (1976) found that high school grades was a very significant predictor of college academic success. Although both high school GPA and rank in class are very reliable predictors when used as single predictor of college performance but high school GPA and rank in class were found to be equally effective when used in combination with aptitude tests (Loeb, 1972).

Aptitude Tests

There are three commonly administered tests of academic ability: (a) The American College Test (ACT), (b) The Scholastic Aptitude Test (SAT), and (c) The National Merit Scholarship Qualifying Test (NMSQT). Astin (1971) found the three tests to be highly intercorrelated and for most practical purposes the scores can be interchanged. Lenning and Maxey (1973) in their study, compared the predictive ability of ACT versus SAT and concluded the ACT test was an efficient predictor
of college GPA as were the SAT tests and perhaps a little better.

Smith (1967) found that ACT scores are second to high school grades in ability to predict college performance. Neely (1977) found the ACT composite score ranked right after high school grade point average and high school rank as the most reliable predictor of college performance.

At many institutions college grades are not very reliable (Lenning and Maxey, 1973). Lenning and Maxey (1973) concluded that grades at many colleges are not very reliable because of diverse grading standards and practices not only within the college but even within departments. However, in many prediction studies high school grades are the only data or best data available. This means that researchers do not have any choice but to use high school grades or class rank as predictor variables in predicting college academic success. The fact that high school grades may be unreliable makes it important to utilize additional predictor variables in studies of college performance.

Price and Kim (1976) found that both high school grades and ACT scores are significant predictors of college success. Their findings indicate that if only two predictor variables could be used for admission to our undergraduate business curriculum, the ACT scores in mathematics and social studies would be the most valid predictor of academic success in college.

The literature indicates that ACT or SAT aptitude tests are a close second to high school rank as a reliable predictor of college academic performance. However, when ACT or SAT test data is not available, then other available aptitude tests with good reliable predictive ability...
can be used.

Boyce and Paxson (1965) conducted a study to determine estimates of predictive ability of various standardized tests which have been used in admissions and guidance programs. Three of the tests administered to random samples of 100 freshman students who had been admitted to college were Cooperative School and College Ability Tests (SCAT), College Entrance Examination Board Scholastic Aptitude Test (SAT) and The American College Testing Program Examination (ACT). The grade point average at the end of the first quarter in college was the dependent variable. The results showed an ACT Composite with a correlation of .57 with the criterion measure, an SAT total score with a correlation of .46, and a SCAT total score with a correlation of .46.

Sena and Weber (1965) conducted a study at Notre Dame College to see whether the ACT or SCAT aptitude tests had the highest degree of predictability of successful college achievement. The results indicate that the correlation coefficient for the SCAT total score was .65 and the ACT composite score had a correlation coefficient equal to .50. The study found that the difference between the two correlations was not significant.

The studies cited indicated that the SCAT aptitude test can be used with reliable results when some of the more popular aptitude test data is not available.

The review of literature and studies just cited provides a basis for formulating a research hypothesis that utilizes high school performance such as class rank and aptitude test scores as predictors of college academic success.
The following research hypothesis was developed:

High school academic performance as determined by high school class rank and aptitude test scores will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing.

**Sex**

Sex is an important consideration because of its influence on college grades and needs further study. Lavin (1965) indicates that very few studies present data on sex differences. There is evidence provided by research that college performance would be different by sex with males tending to be less predictable than females in academic performance (Lavin, 1965; Corlett, 1974). Evidence that sex has enough influence on college grades to warrant further study was provided by a study done by Worthington and Grant (1971).

It is important to control for sex differences in academic prediction studies and perform separate analyses for each sex (Lavin, 1965). Astin (1971) points out that variables that predict performance for males might be different from predictive variables for females and even if the same variables are involved the relationship might be in different directions. Astin (1971) supports the necessity of controlling for sex differences when he states, "a boy is about twice as likely as a girl to obtain borderline or failing grades as a college freshman" (p. 3).

The review of research on college academic performance provides a
basis for formulating a research hypothesis involving sex as a predictor of academic performance in a college baccalaureate program. The research hypothesis that was developed is as follows:

Sex will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing.

Data Processing Prediction Studies

A review of the literature and research since 1960 as listed in the Education Index, Business Periodicals Index, Reader's Guide to Periodical Literature, Business Education Index, and International Dissertation Abstracts was conducted to locate those writings and studies germane to this study. In addition, a computer search of various data bases was conducted through Ferris State College's library. The major data base searched was ERIC (Educational Resource Information Center).

As a result of this search, it became apparent that the literature and research concerning prognosis studies for curricula other than data processing were voluminous. Likewise, there are numerous studies dealing with the prediction of overall college performance. However, no literature or studies directly related to this study were found.

The studies presented in the following paragraphs involve the differential prediction of student success in some facet of a data processing curriculum. Three of the studies were for the two-year post-secondary type of institutions. Two of the studies dealt with the prediction of success in a single course and one study dealt with the prediction of success in four computer programming courses but was
primarily concerned with personality characteristics which could be used to predict success in computer programming courses, not intellectual factors.

Computer Programming Prediction Studies

Correnti (1969) conducted a study of 261 students who had completed the introductory data processing course at four two-year agricultural and technical institutions in New York State. The purpose of the study was to determine if programming aptitude, study habits and attitudes, scholastic aptitude, occupational level of parents, and academic achievement as measured by grade point average, and a college admissions test could be used to reliably predict academic success in a computer programming course. His study initially made use of sixteen independent variables ranging from the State University of New York Admissions Examination (SUAE) to the students' aptitude, attitudes, and college grade point average.

As a result of the sequential testing of the $R^2$'s which Nie (1975) defines as, "the proportion of variation explained by the variables included in the regression equation" (p. 331), the regression equation consisted of previous college grade point average and the mathematics achievement scale of the SUAE. The previous college grade point average variable correlated highest with the criterion variable producing an $R^2$ of .58. When the mathematics achievement scale of the SUAE was added to the regression an $R^2$ of .60 was produced. However, succeeding variables when added did not make significant contributions to $R^2$.

Correnti (1969) made the following conclusions and recommendations
based on his research findings:

1. The variables studied are significant indicators of computer programming success but probably should not be used as success predictors for the purpose of accepting or rejecting a student to a data processing program. The variables could, however, be useful to a data processing program for purposes of advising.

2. Several additional studies were recommended:
   A. A follow-up study of students included in the present study should be conducted to determine their on-the-job performance as computer programmers after graduation.
   B. Further studies are needed to attempt to identify variables which can predict success in computer programming.

The study supports the use of high school and college academic performance, as determined by grade point averages, college course grades, and aptitude tests, to predict academic success in a college level data processing program. Correnti (1969) supports one of this study's purposes when he recommends that a follow-up study should be done to determine on-the-job performance and further studies are needed to identify variables which can be used to predict computer programming success.

**Junior College Business Data Processing Prediction Study**

Larson (1970) conducted research at fifteen California Junior Colleges on the predictive effectiveness of several variables for 153 students who had graduated from business data processing programs. The criterion variable was final overall college grade point average,
which determined if a student was successful and graduated. Larson (1970) started with thirty independent variables, however, his final regression equation utilized only the following: (a) Academic Subject Area Group (GPA-A CAD), (b) American College Test Composite Score (ACT-C), and (c) sex. The combining of these variables resulted in a multiple correlation coefficient (R) of .5849 and an $R^2$ of .3423.

Based on the findings of his research, Larson (1970) made the following conclusions and recommendations:

1. The variable secondary academic course grade point was consistently the best single predictor.

2. In predicting success in the business data processing program, sex is a significant factor.

3. The concentration in secondary school subject areas does not appear to substantially affect academic success in business data processing programs.

4. The open-door policy seems justified for admission to business data processing programs since secondary school achievement does not appear to be necessary for success in data processing programs.

5. The results of this study should not be used as an admissions tool to accept or reject students to a business data processing program. However, it can be used as a counseling and guidance instrument.

6. Similar studies should be done with fewer colleges but include other variables and students who drop out or fail in business data processing programs.

Larson (1970) supports other studies' findings when they conclude that high school grade point average is the single best predictor of
college success and that sex is a significant factor in predicting college performance and is worth including in a prediction study. These findings support formulation of the research hypothesis that high school academic performance and sex are predictors of academic success in college data processing programs.

FORTRAN Programming Course Prediction Study

At New York University, Buff (1972) conducted a differential study in which student background variables were selected and used to develop a multiple regression equation. The sample consisted of 460 students selected from FORTRAN language programming classes at East Stroudsbury State College, Indiana University, University of Pennsylvania, and West Chester State College. The resulting regression equation was used to predict academic achievement in FORTRAN language programming courses. Ten independent variables were used to determine the relationship between them and the success criterion, the grade received in the FORTRAN programming course. Of the 10 independent variables, those associated with high school rank, college grade point average cumulative through the semester prior to FORTRAN programming course, and achievement tests in the areas of mathematics, social sciences, English, and natural sciences proved the most effective predictor of success in the FORTRAN programming courses. The college grade point average produced the highest correlation (R=.48) with the grade received in the FORTRAN programming course.

The results of these studies supports the research hypotheses which state that student academic achievement can be predicted from
prior academic performance, aptitude and achievement test scores, and other characteristics. The combination of independent variables proved more effective than any single predictor. The gains were great enough to justify their use. The results also show a greater correlation for the achievement scores with the criterion variable than did the SAT aptitude test scores.

The results of the Buif (1972) study supports the contention that prior academic performance and aptitude test scores can be used to predict success in a data processing course. However, it looks at only a single course as the criterion variable while the writer's study proposes to use a total undergraduate curriculum in data processing. A further observation notes that Buff (1972) uses prior college grade point average as a predictor variable and not the secondary school grade point average as the writer proposes to use.

COBOL Programming Course Prediction Study

At the University of North Dakota, Sando (1973) performed a study to determine if secondary school, personal, and collegiate independent variables could be used to predict academic performance in COBOL computer programming courses. This study is very similar to the Buff (1972) study in the selection of the criterion variable, a computer programming language course. Prediction equations were developed to predict both student performance in COBOL computer programming and student dropout. The sample consisted of 232 students from five colleges who were enrolled in a COBOL programming class during the fall semester of 1972. A standardized COBOL test was developed and administered to the
students upon completion of the COBOL course. The score on the test was the criterion rather than course grade. This was intended to eliminate the problem of differences in teacher grading procedures. The independent variables were high school grades and rank, sex, ACT scores, and some college course grades.

Sando (1973) made the following conclusions as a result of his research findings:

1. The college course variables were consistently the best set of predictors.

2. Age and sex were not significant in predicting dropout or performance in the COBOL programming course.

3. Cumulative college grade point average is a significant predictor variable in predicting dropout or performance in the COBOL course.

4. The students' relative high school class rank consistently correlated high with prediction of student dropout and COBOL performance.

5. Natural science, introduction to data processing, and computer programming college courses are the most significant in the prediction equation for predicting COBOL dropouts.

6. Computer programming, economics, and accounting college courses are the most significant in the prediction equation for predicting COBOL performance.

7. High school class rank was the only high school data that made any significant contribution to prediction of dropout performance in COBOL classes.
Based upon the cited conclusions, Sando (1973) recommends that further research should be conducted before definite selection policies are established for students of COBOL programming classes. This means the findings of this investigation should be used as guidelines for student advisement and not for purposes of admission.

The results of Sando's study adds support to the research hypothesis that both high school academic performance and prior college academic performance can be used to predict both success and dropout in a data processing course.

Two-Year Post-Secondary Data Processing Prediction Study

Another related study was conducted by Gray (1974) at Georgia State University. The purpose of this study was to see if age, sex, and certain achievement and aptitude test scores could be used to predict success in the two-year post-secondary data processing program at the Dekalb Technical School. The results of the study were then to be used to set up guidelines for the counseling and guidance of prospective data processing students.

The study population was 489 students enrolled from 1962-1971 in Dekalb Technical School data processing program. The successful completion of the data processing curriculum and college cumulative grade point averages were the dependent variables. The independent variables were age, sex, Revised Programmers Aptitude Test scores, aptitude test for programmer personnel scores, and scores in several areas of the General Aptitude Test Battery.

Gray (1974) concluded that sex should be considered when using
scores from the Revised Programmers Aptitude Test (ATPP) and the General Aptitude Test Battery for purpose of student counseling. Females score significantly higher than male students on the ATPP. Since the study found that sex makes a difference in the score received on the Revised Programmer Aptitude Test, it would tend to support the research hypothesis that sex would be a predictor of career success for data processing baccalaureate graduates.

The study findings indicate that scores from the aptitude tests are valid predictors of success in a data processing curriculum. These test scores should not be used to determine admission to the program but can be used effectively for the counseling of prospective students with regard to their probable success in the data processing program.

Like Correnti's (1969) study, Gray (1974) confined the investigation to the two-year post-secondary data processing curriculum. Therefore, the results have definite limitations. Additionally, since the Gray (1974) study has only the independent variable of sex in common with the current study, the results have limited usefulness.

The data processing studies reviewed provide evidence that there is a difference in performance in college programs based on sex and that sex should be considered in future studies. Therefore, this evidence supports the formulation of a research hypothesis involving sex as a predictor of data processing career success.

The following research hypothesis was developed from a review of the above literature:

Sex will be found to be a reliable predictor of data processing career success as determined by an employer
rating.

The review of data processing prediction studies and other related studies cited provide a basis for formulating a research hypothesis that utilizes high school and college academic performance as a predictor of whether or not a student would drop out of Ferris' baccalaureate program in data processing. The research hypothesis that was developed is as follows:

High school and college academic performance as determined by course grades received in selected data processing and college English courses will be found to be a reliable predictor of a dropout in Ferris' baccalaureate program in data processing.

In summary, the cited data processing studies provide support for the utilization of high school academic performance, college academic performance, achievement tests, and sex as independent variables which can be used in a multiple regression analysis to generate prediction equations for the purpose of predicting dropouts from a data processing curriculum, predicting success or graduation from a data processing curriculum and data processing career success.

Employer Follow-Up Studies

The success of a college curriculum or program can best be measured by the success of its graduates. This means a high level of demand for them must be maintained by designing the most competent curriculum possible. To develop an effective curriculum input must come from the

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graduate, the graduate's employer, as well as the faculty and administration.

The employer follow-up study has the potential capacity for providing the college with information upon which to make decisions on admissions policies; develop course and curriculum content; improve articulation with industry; and give the counselor a basis for advising students regarding success expectation and career choices (O'Connor, 1967).

The employer follow-up is capable of satisfying many areas of interest:

1. Evaluate personal and technical skills of graduates.

2. Assess the competence level of a course or program.

3. Determine present and future supply and demand for graduates of a particular course of study.

4. Determine how specific program graduates compare with employees without such training.

5. Determine the primary sources of the initial hiring of graduates.

6. Elicit employer recommendations for new areas of training to be developed.

7. Elicit employer recommendations for improving skills of program graduates.

8. Develop employer contacts and assist the public relations effort of the educational institution. (Patterson, 1976, p. 9)

The literature review revealed that numerous studies had been done to satisfy most of the listed benefits (Samuelson, 1959; Grant, 1958; Murphy, 1968; Patterson, 1976). However, no studies were found that concentrated on the content and competence of a particular
curriculum or program as determined by the employer. There appears to be a void in the area of employer follow-up research.

For many years there has been numerous follow-up studies conducted regarding college graduates and vocational school graduates. However, most of these studies were conducted by surveying the graduates rather than their employers. A review of the literature indicates that very little research involving employer follow-up studies has been done regarding college graduates. Most of those done were studying all of a particular college's graduates and not of a specific program. Since, there is very little literature available on employer follow-up studies the emphasis of this research on employers rather than graduates would make the information gained of value.

No research was found that directly related to the baccalaureate data processing graduates of a four-year college, probably since few or none have been done. However, some literature was found that made reference to data processing follow-up studies at the secondary vocational level and the two-year technical school level. Although these studies are not for four-year baccalaureate programs, they are related to career success for graduates of educational data processing programs. There are some similarities in essential entry level job skills for graduates of secondary vocational, two-year technical and four-year baccalaureate educational programs. Additionally, these studies support the utilization of employer ratings of graduates as a means of evaluating career success.
Employer Follow-Up Studies--Data Processing

Leavitt (1971) conducted an employer follow-up study of graduates of the Albuquerque Technical-Vocational Institute (T-VI) to determine if the Institute was meeting the employers' needs, to receive recommendations from the employers on program improvements, and to validate Institute applicant screening and grading by comparing them to employer ratings.

Data from employer survey responses were analyzed for each of the ten T-VI programs including data processing, to provide a correlation matrix comparing each GATB score, beginning and ending wages, grade point average and employer ratings with every other variable. The results showed that as a general rule, the GATB Intelligence, Verbal, Numerical and Clerical Perception scores predict graduates' success best. This supports the research hypothesis that high school and college academic performance, as determined by aptitude test scores, will predict career success in data processing.

The grades at T-VI were divided into four categories: mathematics, English, major subjects, and a composite of all GPA's. The results indicate that the major subjects grades had the best predictive value for the employers' ratings and wages. The data processing program had fewer significant correlations in the matrix than most other programs. There were only twenty-one out of 225 possible. For data processing graduates, the mathematics and composite GPA's appeared to predict employer ratings. This supports the research hypothesis that high school and college academic performance will predict career success in data processing.
The study made several recommendations for other researchers that could be helpful to this study.

1. Employer survey instruments, if possible, should be one page.

2. Results of this study indicate that a span of up to ninety days is needed to allow for the mailing of three survey letters and receive a high percentage of returns.

3. Researchers will get better results by contacting non-respondents by personal visit rather than by telephone.

4. When conducting a graduate follow-up study the researcher should determine what data is available on the graduates in order to avoid unexpected loss of data.

Gell (1975) conducted an employer follow-up study of career program graduates of Montgomery Community College. Computer Science is one of the career programs in the study. Computer Science is somewhat related to Data Processing. However, there is enough differences that a reader of this study would have to be extremely careful in applying the study results to a data processing program.

The employers of 280 career program graduates were selected as the study population. One hundred and ninety-nine or 71% provided employer names and addresses. However, only 96 or 34% gave permission to contact their employers. The author cautions that a bias may be present due to the possibility that the graduates who gave permission were enjoying a better work relationship with their employer.

The employer's survey instrument focused on three major areas: an evaluation of the graduates' work preparedness, suggestions for
program improvements, and the meaning of an associate degree in the business world. The study found that the graduates in every area were found to be adequate or more than adequate by employers. Employers of Computer Science graduates felt that the program should place more emphasis on mathematics, programming, and systems hardware. Employers thought knowledge of coding was excellent, but that knowledge of data base management systems needed improvement.

However, the findings were for two-year college programs which indicates their use for this study will have to be done with caution. The study findings do support the use of employer ratings and college academic performance as a predictor of the graduate's data processing career success.

Follow-Up Studies—Non-Data Processing

Patterson (1976) developed and implemented an employer follow-up system for Amarilla College to be used by all Texas public community and junior colleges. In developing the model 544 graduates had Graduate Follow-Up Questionnaires mailed to their employers. After two mailings and a telephone follow-up a 61% response was realized.

The study indicates that the only restraining legal implication is the "Family Educational Rights and Privacy Act of 1974" and the effect to employer follow-up studies is negligible. This would seem to indicate that in these types of studies it is not necessary to get permission from the employee to contact his/her employer.

Another problem area that might jeopardize a good response rate is the capability of getting the employer survey instrument to the
proper person. The graduates' immediate supervisor is the best qualified to evaluate his/her performance and should complete the questionnaire.

The author concludes that employer follow-up studies would provide department chairpersons and faculty with data needed to establish new or improve existing curricula to provide employers with better prepared graduates. Advisory committees could also make recommendations for curriculum improvement based on follow-up study findings.

Collin (1971) conducted a follow-up study of the 1966-1970 graduates of the Alberta Agricultural and Vocational Colleges. The objective of the study was to determine the effectiveness of the college's various programs and then obtain suggestions from graduates for needed curriculum changes to allow the college to better meet the needs of current and future students.

Questionnaires were sent to 1,243 graduates of which 804 were returned complete, for a 66% return. Relevant data obtained through the direct mail survey included: information about the graduates since graduation, opinions of the graduates on the program they completed at college, opinions on their overall experience of attending college.

The author, based on the findings of the study, concluded:

1. Job preparation was the major reason students had for attending college.

2. A high proportion of college graduates obtained satisfactory employment immediately upon graduating and it was related to their college training.

3. The graduates perceived their college training to be adequate
employment preparation.

4. The majority of graduates perceived the programs and facilities at the college as very good.

This research lends support to the validity of graduate follow-up studies. But since it is surveying graduates rather than the graduate's employer, the study has limited applicability to the present study.

The follow-up studies reviewed support the validity and need of graduate employer follow-up studies. The results of the studies cited support the use of high school and college academic performance to predict graduate career success. On the basis of this research, the following research hypothesis was formulated:

High school and college academic performance as determined by high school class rank, aptitude test scores, course grades received in selected data processing courses and English courses will be found to be a reliable predictor of career success as measured by employer follow-up of graduates of Ferris' baccalaureate program in data processing.

Summary of Literature

Because of the variety of literature presented in this review, a brief summary of some of the key observations may be of value to the reader. These major points are:

1. There have been numerous prediction studies done spanning the last sixty years involving the prediction of academic success in colleges and universities.
2. The research evidence overwhelmingly supports the use of high school and college intellective factors such as high school class rank, aptitude test scores, and college course grades to predict college academic performance.

3. The literature indicates that sex has enough influence on college academic performance to warrant further study. Very few studies present data on sex differences. This supports the value of including sex as a predictor variable in this study.

4. Several studies were reviewed which predicted success in either college data processing courses or programs. These studies further supported the previous studies in the validity of using high school and college intellective factors to predict academic success.

5. Several follow-up studies were located and reviewed. In general, most of the studies' data was obtained by interviewing the graduate rather than the graduate's employer. Most of the studies were conducted for two-year or vocational programs. This indicates a real need for follow-up studies for baccalaureate level programs.

6. A few studies were located that dealt with employer follow-up studies for data processing programs. However, the studies generally included several programs and did not concentrate on the data processing. The research results do support the value of employer follow-up studies for data processing baccalaureate level programs.

In summary, the literature and research reviewed supports the research hypotheses that were developed and the need for this study. These research hypotheses will be stated in Chapter III.
CHAPTER III

METODOLOGY

Introduction

This study was of an experimental-survey research design. The purpose was to explore the predictability of academic achievement and career achievement for graduates of Ferris State College's B. S. program in data processing.

This chapter gives an explanation of the study design, details the hypotheses to be tested, describes the study population, describes the data gathering procedures, explaining the instrumentation used and how it was administered, and presents in detail the statistical procedures used.

Description of the Study

The first phase of this study was designed to determine if data, available through a prospective student's high school record, could be utilized to predict the final overall grade point average and data processing curriculum grade point average. The multiple regression analysis technique was utilized to generate the prediction equation. The multiple discriminant analysis technique was utilized to determine if the high school data could be used to predict which students would drop out and which would persist in the program. This was done for each of the four academic years in the program.
The second phase of the study was designed to see if successful graduates with one to three years' data processing work experience had certain academic characteristics in common. For this study, it was decided the descriptive research design was the most appropriate approach. Information was gathered from Ferris State College's student records and through the use of a direct mail survey. An instrument was designed and administered via mail to the graduate's supervisor to measure the career success variable. The administration of the instrument results in a numeric score which is the criterion variable for a stepwise multiple regression analysis with noncontrolled inclusion. The independent variables were grades received in college English courses, grade point average received in data processing major and high school rank.

The study sample was identified through a combination of procedures. The study sample for the first phase was comprised of two groups. All data processing baccalaureate graduates that started the data processing major course sequences with D-P 110, Introduction to Data Processing, in the years 1972, 1973, and 1974 were the successful group. The drop-out group was selected by a random sampling technique utilizing a random number table. The study sample for the second phase was the full population of all B.S. data processing graduates that started Introduction to Data Processing in 1972, 1973, and 1974.

**Major Research Hypotheses**

The research hypotheses were formulated from a thorough review of related literature as presented in Chapter II. The research
hypotheses were developed to meet the study objectives as stated in Chapter I. The literature and research review which was based upon the study objectives provided a strong support for the research hypotheses presented in Chapter II.

The first objective of this study, which is to determine if high school class rank, SCAT test scores, college grades and sex could be used to predict success in Ferris' Data Processing baccalaureate program, led to the development of the following research hypotheses:

I. High school academic performance as determined by high school class rank and aptitude test scores will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in Data Processing.

II. Sex will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing.

IV. High school and college academic performance as determined by course grades received in selected data processing and college English courses will be found to be a reliable predictor of a dropout in Ferris' baccalaureate program in data processing.

The second objective of this study, which is to determine if high school class rank, SCAT test scores, college grades and sex could be used to predict career success in data processing, led to the development of the following research hypotheses:

III. Sex will be found to be a reliable predictor
of data processing career success as determined by an employer rating.

V. High school and college academic performance as determined by high school class rank, aptitude test scores, course grades received in selected college data processing and English courses will be found to be a reliable predictor of career success for graduates of Ferris' baccalaureate program in data processing.

In the Statistical Procedures section, later in this chapter, 12 experimental hypotheses are generated from these five research hypotheses.

The remainder of this chapter describes the study design, population, sampling procedures, the development and testing of the instrument, data collection procedures, and data analysis methods.

The Population

The population, from which the study population was selected, was all the students that have been admitted and enrolled in the baccalaureate program in data processing at Ferris State College since the program was established in 1964.

The study population selected was those students admitted and enrolled in the data processing baccalaureate program for the years 1972, 1973, and 1974. The baccalaureate students were selected over the two-year associate degree students because approximately 90% of data processing students are in the B.S. program and close to 80% of
those enrolling in the associate program enroll in the B.S. degree program, either prior to graduating from the A.A.S. program or immediately upon graduating. Further, students enrolling during this three-year period have sufficient data available at Ferris and are products of the data processing program at a time when the program very clearly resembles the present curriculum.

**Study Population--Phase One**

The sample for the first phase of the study was composed of two groups—graduates of the baccalaureate program in data processing at Ferris State College and dropouts of the program. The total population of program graduates since 1965, the year of inception, numbers approximately 900 and the total number of dropouts is several times this amount.

For the graduate portion of the sample, the complete population of B.S. graduates that had started the data processing sequence in the Introduction to Data Processing course in the years 1972, 1973, and 1974 was used. This group was selected for several reasons. First, the vast majority would graduate in 1976, 1977, and 1978. This is necessary because it was decided to do an on-the-job follow-up phase of the study for those graduates that had acquired from one to three years' work experience. Secondly, the Ferris' alumni records contained practically all valid addresses on this group. Also, most of the other data for the independent variables was available for this group at Ferris. There were 162 graduates for these three years of which the necessary data was available for 131. Of the 131, 125 graduates
provided the necessary employer information needed for the study. The final sample size used for the career success phase of the study was 125.

The dropout sample for the study was determined to be all those students that enrolled in the Introduction to Data Processing course during the years 1972, 1973, and 1974, but did not graduate from the data processing program during the years 1978 or before. This number of dropouts totaled 167. Of this number needed data was available on 146. Therefore, it was decided to use this as the study sample size for dropouts.

It was decided to use this group of dropouts because they were enrolled in the data processing program during a period of time in which the curriculum would be very similar to the program that the sample of graduates for phase two of this study had experienced. This would ensure, as much as is feasible, that the curriculum background for these study groups would be the same. Since the dropout sample and the success sample have experienced the same curriculum; the conclusions and recommendations of the study should be more reliable. One final reason for this sample group of dropouts is the availability of needed data in Ferris' records.

Study Population--Phase Two

The potential sample for the second phase of the study was determined to be all B.S. graduates of the data processing program at Ferris State College for the years 1976, 1977, and 1978 that could be located through Ferris' alumni records. Of the 162 potential sample
size, data needed for the variables was available on 131 in Ferris' records. After requesting the 131 graduates to supply their employer's name and address and their supervisor's name, 125 provided the necessary information. However, 4 of the 125 were no longer in data processing. Therefore, the final graduate sample size was 121.

**Ferris' Data Processing Program Description**

The data processing program at Ferris has as an objective to prepare graduates for careers in business information systems. The graduate of Ferris' data processing baccalaureate program is usually responsible for the design and development of business applications computer programs. Typical applications are inventory control, payroll/personnel, order entry, and various financial systems. Graduates usually enter the work place as applications programmers, programmers/analysts, and in some cases as systems analysts. The natural career progression of a Ferris data processing graduate is to start as an applications programmer or programmer/analyst and, through experience, gradually assume more systems analysis and design function and less programming. The next logical career step from systems analysis is some level of data processing management.

Since the graduates are employed in business organizations it is important for them to understand how business functions. For this reason, Ferris' data processing program has a group of business courses called the business core. The data processing graduates are provided a strong foundation in functional business areas through courses in accounting, marketing, finance, management, economics,
quantitative analysis and business law. For a complete description of the Ferris' B.S. Data Processing program see Appendix A.

Instrumentation

One measurement instrument was designed for use in this research. The instrument, administered by mail, measured the respondent's perceived knowledge of the data processing graduate's job related skills (both data processing and human relations skills) and how Ferris' graduates compared to data processing graduates of other colleges and universities. Following are discussions on the instrument's construction, validation and pilot testing.

Rationale for Designing the Instrument

Since this study design involves Ferris State College's data processing curriculum and not data processing programs in general, an appropriate instrument was not available. Therefore, it was necessary to design a valid and reliable instrument which would measure employer perceptions of graduates' job related skills.

A three stage process was utilized to develop the data processing Skills and Knowledge Assessment instrument. These steps were: (a) identification and validation of items, (b) instrument construction, and (c) pilot test of the instrument. Following are sections discussing these stages.

Stage 1--Identification and Validation of Items

The objective of this stage was to identify valid items from which
statements designed to measure job related skills in the areas of systems analysis, programming, and human relations were generated.

A panel of ten experts was selected from the faculty of the Data Processing Department of Ferris State College. The panel was asked to identify job related skills in the areas of systems analysis, programming, and human relations that were objectives of the Ferris baccalaureate program in data processing. These objectives were then identified and used to generate statements designed to measure job related skills. The statements were organized into the Skills and Knowledge Assessment instrument.

Stage II—Instrument Construction

The Ferris State College Data Processing Advisory Committee, a group of twelve data processing businessmen, were used as an expert panel to help construct, evaluate, and validate the Skills and Knowledge Assessment instrument.

Each member of the panel was asked to sort the items on the instrument into the following four categories:

1. Programming skills
2. Systems analysis skills
3. Human relations skills
4. Other

Since there was a total of twelve panel members the rule was determined to be any item identically categorized by a majority of seven or more panel members was placed in that skill category. See Appendix C for a list of these items. Therefore, the instrument is
divided into four categories with all items related to programming
skills in one section of the instrument and all items related to
systems analysis skills in another section, and so on. The categori-
zation of the items as determined by the Ferris State College Data
Processing Advisory Committee is given in Table 1. See Appendix E
for the Graduate Supervisor Survey Materials, as they evolved from
the expert panel process, to be used in the pilot study. Item number
one, which asks about the graduate's knowledge of data processing and
item number eight, which asks about the graduate's understanding of
the changing data processing industry, were eliminated since there was
no skill category receiving a majority of votes. Item 12, which asks
about the graduates knowledge of file access methods and skills in
designing files, was almost evenly split into two skill categories.
It was decided to break this item into two items with one in each cate-
gory. The remainder of the items were placed in the skills category
as determined by the decision rule. The final version of the Skills
and Knowledge Assessment instrument and other related materials, which
were used in the follow-up study, are given in Appendix F.

Each panel member was also asked to evaluate each item on the
instrument and determine if the items met certain tests. The panel
members were asked the following questions for each item:

1. Are the items clear in meaning?
2. Are the items as concise as they should be?
3. Are there any double meanings?
4. Are there any items you do not understand?
5. Are there any items which seem offensive to you?

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Table 1
Item Categorization by Members of Ferris' Data Processing Advisory Committee* for the Skills and Knowledge Assessment Instrument

<table>
<thead>
<tr>
<th>Item</th>
<th>Responses Programming Skills</th>
<th>Responses Systems Analysis Skills</th>
<th>Responses Human Skills</th>
<th>Responses Other</th>
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<tr>
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<td>0</td>
<td>10</td>
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<td>7</td>
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<td>0</td>
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<tr>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

*Number of committee members responding is 12.
6. Are there any legal concerns with any of these items?

7. Will this instrument measure what it is intended to measure?

8. Would this instrument be conducive to a telephone survey?

9. If a telephone survey is appropriate, should the supervisor have the questionnaire prior to the telephone conversation?

10. Are there enough questions in each area--programming, systems analysis, and human relations?

As a result of this process the items were modified, eliminated and in some cases rewritten into several items. In addition, some items were reclassified from one category to another. The instrument as it was used in the pilot study appears in Appendix E.

In general, the panel of experts thought the instrument would measure what was intended and that the overall study was worthwhile and feasible. The panel indicated the instrument would be more effectively administered by direct mail rather than by telephone. The telephone survey would be appropriate for the follow-up contact.

After the Ferris Data Processing Advisory Committee had processed the instrument the revised instrument was then reviewed again by the Ferris Data Processing Faculty panel. After further revisions the instrument was ready for pilot testing.

**Stage III-Pilot Test**

A pilot test of the instrument was conducted during the Spring Quarter of 1979-1980 academic year. Six members of the Ferris State College Data Processing Advisory Committee that were also supervisors of alumni included in the study sample were selected to participate.
in the pilot study. The participants were sent under a cover letter, the instrument cover letter, instruction sheet, the Skills and Knowledge Assessment instrument, and the Supervisor's Profile form. The supervisors were requested to complete the Skills and Knowledge Assessment instrument on the selected graduate, complete the Supervisors Profile form and make some specific observations during the process. They were asked to record the time it took to read the cover letter, instructions and complete the instrument. The pilot study participants were asked to examine the various documents for clarity and other potential problems. The supervisor participants were requested to not forward the study documents to Ferris but to wait for a telephone discussion of the process and then forward by mail the study documents with written comments.

The study participants took an average time of thirty minutes to read and complete the survey instrument. No major problems were noted. However, one participant in the pilot study did indicate that the cover letter, as appears in Appendix E, could be a little clearer with regard to directions on how the supervisor is to evaluate the graduate's performance. The letter used in the pilot study says; "Also, if the graduate listed is your only employee, compare performance with others who have worked in the same position." The final version of the letter as appears in Appendix F was changed to read, "Make your comparative judgments to employees of comparable positions." Other than the above change the pilot study participants felt the graduate follow-up study cover letter was clear and easy to understand.

Additionally, some pilot study participants indicated that the
Instructions for Respondent sheet as appears in Appendix E needed some changes to make it clearer and easier to understand. The final version of the Instructions for Respondent, reflecting the pilot study concerns, appears in Appendix F.

As a result of the pilot study the Skills and Knowledge Assessment Instrument was further refined and was then determined to be ready to administer to the study sample of data processing graduates. The final version of the study cover letter, instruction sheet, Skills and Knowledge Assessment instrument, and Supervisor's Profile form are given in Appendix F.

General Procedures

Permission to collect data on alumni for purposes of this study and to survey the supervisors of data processing graduates was obtained from the Vice President of Academic Affairs at Ferris State College.

For phase one, data on independent variables was collected from records maintained in Ferris' Registrar's Office, the College Testing Center, and the School of Business. This data was hand coded from the various documents to an eighty column coding form from which computer readable data cards were keypunched. This data was then used as input to the stepwise multiple regression program in the BMD statistical package at Ferris State College.

For phase two of the study, the data processing Skills and Knowledge Assessment instrument was administered by mail to the sample of 121 data processing supervisors. The supervisors were located and identified through the data processing alumni. After receiving the
completed questionnaires from the study participants, the individual respondent's scores for each of the 20 items were keypunched into computer readable data cards for input to the BMD stepwise multiple regression program. The data on all variables, including the Skills and Knowledge Assessment instrument scores, were inputed to the BMD Missing Value Correlation program. The program selects missing value covariance and correlation submatrices and builds a missing value correlation matrix with estimates of correlations.

Each item on the instrument has a possible score ranging from 0 to 5. The Programming Skills section has a possible range of scores from 0 to 35; the Systems Analysis Skills section has a possible range of scores from 0 to 30; the Human Skills section has a possible range of scores from 0 to 25; and the Other section has a possible range of scores from 0 to 10. The Skills and Knowledge Assessment instrument has a possible range of 0 to 100 for the total score.

Statistical Procedures

Later in this section, 12 experimental hypotheses were generated from the five research hypotheses and were tested in the null form for both phases of the study. Descriptive statistics were used to either support or find inconclusive the research hypotheses. For Hypotheses 1 and 2, the statistical procedure utilized to test the null form was the stepwise multiple regression analysis procedure with noncontrolled inclusion. For Hypotheses 3 and 4, the chi square test of independence was used to test the null form. For Hypotheses 5, 6, 7, 8, and 9 the statistical procedures utilized to test the null form was the t-test.
for independent means. For Hypotheses 10, 11, and 12 a correlation
analysis was done to test the null form, which stated there is no
relationship. The .05 level of significance was used for all tests.

The remainder of this chapter is comprised of the major research
hypotheses, with related null hypotheses, data collection, and data
analysis procedures.

Research Hypothesis 1

High school academic performance as determined by high school class
rank and aptitude test scores will be found to be a reliable predictor
of academic performance in Ferris State College's baccalaureate program
in data processing. The premise underlying this hypothesis was that
previous research supports high school academic performance as a pre-
dictor of academic performance in various curricula as well as overall
college performance.

The null hypotheses to be tested are as follows:

**Hypothesis 1.** A predictive equation based on rank
in high school graduating class, School and College
Ability Test (SCAT) verbal score, and SCAT quantita-
tive score will not predict overall grade point
average in Ferris' Data Processing baccalaureate
program.

**Hypothesis 2.** A predictive equation based on rank in
high school graduating class, School and College Ability
Test verbal score, and SCAT quantitative score will not
predict grade point average in Ferris' data processing
major courses.

**Hypothesis 3.** The regression equation generated will not be useful in predicting success in the data processing curriculum as measured by overall college GPA.

**Hypothesis 4.** The regression equation generated will not be useful in predicting success in the data processing program as measured by data processing course GPA.

**Research Hypothesis II**

Sex will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing. Previous research provides a rationale for formulating this hypothesis. Several studies indicate that sex is an important consideration in research on college performance (Lavin, 1965; Astin, 1971; Worthington & Grant, 1971; Corlett, 1974).

The null hypotheses to be tested are as follows:

**Hypothesis 5.** There is no difference in final grade point average in Ferris' data processing program based on sex.

**Hypothesis 6.** There is no difference in grade point average between males and females in Ferris' data processing major courses based on sex.
Research Hypothesis III

Sex will found to be a reliable predictor of data processing career success as determined by an employer rating. The rationale for this hypothesis was based on research that indicates sex is a significant factor in predicting success in data processing (Larson, 1970; Gray, 1974).

The null hypothesis to be tested is as follows:

Hypothesis 7. There is no difference in overall score on the Skills and Knowledge Assessment instrument between males and females.

Research Hypothesis IV

High school and college academic performance will be found to be a reliable predictor of dropout or persistence in Ferris' baccalaureate program in data processing. The belief underlying this hypothesis was that the more successful the student was in previous academic work the more propensity the student would have to succeed.

The null hypotheses to be tested are as follows:

Hypothesis 8. For students at the end of the second year of the data processing program, there is no difference between persisters and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English course grades, GPA for three introductory data processing courses, and sex.
**Hypothesis 9.** For students that finished the sophomore year but did not graduate at the end of the fourth year, there is no difference between persisters and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English grade point average, GPA for three introductory data processing courses and sex.

**Research Hypothesis V**

High school and college academic performance will be found to be correlated with career success for graduates of Ferris' baccalaureate program in data processing. The rationale for this hypothesis was based on research that has shown academic performance to be correlated to job success (Leavitt, 1971; Gell, 1975; Patterson, 1976).

The null hypotheses to be tested are as follows:

**Hypothesis 10.** High school rank, SCAT verbal score, SCAT quantitative score, overall college grade point average, grade point average in the data processing major courses, and English grade point average will not be correlated with the score in the systems analysis section of the Skills and Knowledge Assessment instrument.

**Hypothesis 11.** High school rank, SCAT verbal score, SCAT quantitative score, overall college grade point average, grade point average in the
data processing major courses and English
grade point average will not be correlated
with the score in the programming section
of the Skills and Knowledge Assessment
instrument.

Hypothesis 12. High school rank, SCAT verbal
score, SCAT quantitative score, overall college
grade point average, grade point average in the
data processing major courses and English grade
point average will not be correlated with the
score in the human relations section of the
Skills and Knowledge Assessment instrument.

Independent Variables

The independent variables were selected with consideration given
to the analysis techniques of previous prediction studies and to the
availability of data at Ferris State College.

For phase one of the study, the independent or predictor variables
will be student data available at Ferris State College. High school
rank in graduating class, sex, college course grades and cumulative
grade point averages and School and College Ability Test (SCAT) scores.

The SCAT tests have been administered for several years to all
incoming Ferris freshmen for purposes of recommending placement in
appropriate English and mathematics courses. These verbal and quanti-
tative test scores are available for the study population.

For phase two of the investigation, the independent variables will
include those for phase one plus college course grades in English, accounting, data processing and cumulative grade point average at time of graduation.

**Dependent Variables**

For phase one, the dependent variable is final grade point average in the data processing baccalaureate program at Ferris State College. A 2.00 GPA is required to graduate.

For phase two, the dependent variables are numerical scores received on an instrument administered to the graduate's supervisor. In addition to a total score, the instrument is designed to provide subscores for the skill areas of systems analysis, computer programming and human relations.

Since an overall assessment of graduates' career success was desired for purposes of testing for sex differences, the Skills and Knowledge Assessment instrument total score was used for testing Hypothesis 7. However, for Hypotheses 10, 11 and 12, the instrument's subscores were used for the investigation of career success for specific skill areas.

**Data Classification—Independent Variables**

**SCAT-Verbal**

SCAT-Verbal test score was taken from Ferris' Testing Center records. This data is interval data.
**SCAT-Quantitative**

SCAT-Quantitative test score was taken from Ferris' Testing Center records. This data is interval data.

**Sex**

Sex as a dichotomize variable was recorded in two categories as indicated in the Registrar's records as male or female. Although this data is normally nominal it is being treated as interval by using a dummy variable technique using values of 1 for male and 0 for female (Nie, 1975, p. 374).

**Rank in High School**

Rank in high school class was taken from the graduates' high school grade transcript on file in the Registrar's Office at Ferris State College. This data is being treated as interval by converting rank to percentiles.

**English GPA**

College English GPA was calculated from grades recorded in the Ferris Registrar's Office. This data is interval.

**GPA for Three Introductory Data Processing Courses**

The GPA for Introduction to Data Processing, Computer File Organization and Computer Programming I, three introductory data processing courses, was calculated from grades recorded in the Ferris Registrar's Office. This data is interval data.
Data Classification—Dependent Variables

Overall GPA

The overall GPA for Ferris' Data Processing B.S. program was recorded from the student records in the Registrar's Office at Ferris. This data is interval data.

Data Processing GPA

The GPA for data processing courses was calculated from grades recorded in the Ferris Registrar's Office. This data is interval data.

Total Score on Skills and Knowledge Assessment Instrument

The score was obtained by taking the sum of the individual numeric rating responses for items 1 through 20. The possible score on each item value ranges from 1 to 5 with a total possible average score ranging from 1 to 5. The scores will be calculated as an average of those observed, thus zeros will be treated identical to blank responses.

Systems Analysis Score on Assessment Instrument

The score was obtained by taking the sum of the individual numeric rating responses for items 7, 8, 9, 11, 12 and 13. The possible score on each item ranges from 1 to 5 with a total possible average score ranging from 1 to 5. This data is interval data.

Human Relations Score on Assessment Instrument

The score was obtained by taking the sum of the individual numeric
rating responses for items 14, 15, 16, 17 and 20. The possible score on each item ranges from 1 to 5 with a total possible average score ranging from 1 to 5. This data is interval data.

**Dropout or Not Variable**

Data on this variable was recorded from the student records on file in the Ferris Registrar's Office. This is dichotomize nominal data similar to the variable sex. It was decided to treat it as interval by using the dummy variable techniques as previously explained. Yes would have a value of 1 and no would have a value of 0.

**Supervisor Profile**

This is not a variable that will enter into the statistical tests. However, the data collected on the supervisors will be presented in tabular form for the purpose of providing background information on the graduates' supervisors.

**Data Collection**

To meet Western Michigan University's and Ferris State College's requirements to assure the rights of human subjects, approval for methodology and data collection was obtained from both institutions.

Data collected from Ferris State College's records included student's relative high school rank, sex, SCAT Verbal and Quantitative scores, high school grade point average, final all college GPA, final data processing course GPA, course grades in college English courses, GPA for the following three data processing courses: Introduction to

Through the direct mail survey of graduates' supervisors, data was obtained on the supervisor's perception of the graduate's level of job related skills. The cover letter, graduates' Skills and Knowledge Assessment instrument, and instructions used in the survey are given in Appendix F.

In order to accomplish the direct mail survey, it was necessary to obtain the graduate's employer's address and supervisor's name. This was also done by a direct mail survey of the graduates in which the graduates were asked to provide their employer's name and address and supervisor's name. The graduates' addresses were obtained from Ferris State College's alumni records. The cover letter, data collection form, and follow-up letters used to collect the graduates' employer information are given in Appendix E.

Statistical Assumptions

This study made use of multiple regression and correlation analysis, a parametric test, which should have four basic assumptions met. Nie (1975) presents the following assumptions:

1. The sample is drawn at random.

2. Each array for Y for a given combination of X's follows the normal distribution.

3. The regression of Y and X's is linear.

4. All the Y arrays have the same variance. (Nie, 1975, p. 341)

The data collection for this study was assumed to meet all basic assumptions, with the exception of random sampling, for the following.
reasons:

1. Random sampling procedures were not followed. All the data available were used.

2. In examining frequency distributions most variables appear to be unimodal and approximately symmetric.

3. In examining the residuals no significant trends in the residuals were noted.

4. In examining the residuals no evidence was found in the residual plots to indicate violations of homogeneity of variance assumption.

The multiple regression analysis technique generally requires that both independent and dependent variables are measured on interval or ratio scale (Nie, 1975, p. 320). However, a nominal-scale variable can be inserted into a multiple regression equation. Ordinarily nominal numbers cannot be treated as "scores" as they would be in conventional regression analysis (Nie, 1975, p. 373). To solve this problem a set of dummy variables is created by treating each category of a nominal variable as an individual variable and assigning arbitrary scores for all cases depending upon their presence or absence in each of the categories (Nie, 1975, p. 374). This means a nominal dichotomize variable such as sex, with two cases, can be assigned arbitrary metric values of 0 and 1 and may be treated as interval variables (Nie, 1975, o. 374).

All the variables in the study were determined to be interval except rank in high school class and sex. The high school class rank which is ordinal was converted to percentiles by using class size.
Because percentiles are interval, it was decided to treat class rank as interval data. It was decided to treat sex as an interval data by treating it as a dummy variable as previously explained.

The t-test for independent means with unknown population variance, another parametric test used in the study for hypotheses 5, 6, 7, 8 and 9, has four basic assumptions which should be met:

(a) The measurements were sampled at random (b) from normally distributed populations (c) with homogeneous variances, that is equal variances, and (d) the samples are independent. (Glass and Stanley, 1970, p. 295)

The data collected for this study was assumed to meet all basic assumptions, with the exception of random sampling, for the following reasons:

1. Random sampling procedures were not followed. All the data available were used.

2. Although the variable populations are not normally distributed, normality is obtained through the Central Limit Theorem. Furthermore, research has shown that the t-test is robust with respect to the violation of normality.

3. The t-test is robust with respect to the violation of homogeneity of variance.

4. The samples were chosen independently from independent groups. Furthermore, there is no evidence that would indicate that either the subjects or the groups are related.
CHAPTER IV

RESULTS

Background Summary

This study dealt with twelve experimental hypotheses for each of two groups of data processing students at Ferris State College: graduates of the B.S. program in Data Processing for the years 1976, 1977, and 1978, and data processing dropouts that started the program with the data processing graduates. The hypotheses tested fell into three main areas: (a) predicting success in the B.S. program in data processing—Hypotheses 1, 2, 3, 4, 5, 6; (b) predicting career success in data processing for the graduates—Hypotheses 7, 10, 11, 12; and (c) predicting dropouts—Hypotheses 8, 9. Both groups of students were used in Hypotheses 1, 2, 3, 4, 5, 6, 8 and 9. For Hypotheses 7, 10, 11 and 12, just the graduates were used. Each graduate's supervisor completed and returned a Skills and Knowledge Assessment instrument which served as data for the dependent variable.

This chapter is composed of five major sections for clarity of data analysis presentation. The first section describes data processing graduates and dropouts. The second section includes the findings relative to step-wise multiple regression analysis for testing Hypotheses 1 and 2, chi square test of independence for testing Hypotheses 3 and 4, and t-test for independent means for testing Hypotheses 4 and 5. The third section includes the findings relative to step-wise multiple regression analysis for testing Hypotheses 10, 11 and 12 and t-test...
for independent means for testing Hypothesis 7. The fourth section presents findings relative to t-test for independent means for testing Hypotheses 8 and 9. The final section presents findings pertaining to Pearson product-moment correlation for testing Hypotheses 10, 11 and 12.

Population

The total population from which the study population for the graduate follow-up phase was drawn includes all graduates from Ferris State Colleges' B.S. program in data processing. This program originated in 1963 and has approximately 800 graduates. It was decided that the graduate follow-up phase of the study should have graduates that had been working in the career field for a period of years not to exceed four. Furthermore, more of the needed data was available on this group than any other. For these reasons the study population of graduates was defined as those people graduating in the years 1976, 1977 and 1978. For these three years there were 162 B.S. graduates. Of the 162, 131 were located. It was assumed that the reason for not being able to locate 31 graduates, involved no bias in the study sample. The alumni office at Ferris did not have a current address for these graduates. Therefore, no evidence indicates any bias exists due to these missing graduates. The 131 graduates located were sent a survey form, as presented in Appendix E, requesting their employer's name and address and their immediate supervisor's name. Of the 131, 125 responded with the requested information. Of the nine graduates that did not provide the information, two indicated they did not want to participate.
in the study, four indicated they were not in the field of data processing, and three did not respond in any manner. Of the 125 that responded with the requested employer information, four had either never been employed in data processing or were no longer in the field. The final graduate population in the study was 121.

The Graduate Knowledge and Skills Assessment instrument (see Appendix D) was mailed to all 121 supervisors. Of the 121 receiving the instrument, 116 returned the completed instrument. Of the five that did not return the information, three employers responded by indicating that their company policy did not permit releasing this information. The remaining two did not respond at all. The resulting response rate was 95 percent. The assumption was made that the five percent not responding was not large enough or had any special characteristics that would bias the study results.

_**Missing Data on Graduate Study Sample**_

Over all the independent variables there is an average of 9.3% of the data missing. This is due to incomplete records at Ferris State College and some missing supervisor responses on the Graduate Knowledge and Skills Assessment instrument.

The dependent variables of overall college GPA and data processing GPA had no missing data. Ferris' records were complete for these variables.

For the step-wise multiple regression analysis there was complete data on 77 cases. In the case of correlation analysis there was more data available because the analysis was done by pairing the variables.
Thus, for correlation, a case was not discarded unless the variable involved in the correlation had missing data. Table 2 provides information on the number (N) available for each variable. From the frequency table the number of missing data cases is readily determined.

Hypotheses 1 and 2

Hypotheses 1 and 2 involve the predicting of academic success in Ferris B.S. program in data processing.

Hypothesis 1. A predictive equation based on rank in high school graduating class, SCAT verbal score; and SCAT quantitative score will not predict overall GPA in Ferris' Data Processing baccalaureate program.

By utilizing a step-wise multiple regression analysis for the data processing student group (N=271) with the independent variable of high school rank entered first in the step-wise regression and SCAT quantitative and SCAT verbal entered last in the step-wise regression, it was found that:

1. High school rank entered first with a multiple R of .501 and a multiple R$^2$ of .251.

2. SCAT quantitative score entered second with a multiple R of .5423, increasing the R$^2$ by only .043 to R$^2$ = .294.

3. SCAT verbal score entered third with a multiple R of .551 and increasing the multiple R$^2$ by .010 to R$^2$ = .304.

A summary of these results is given in Table 3.
Table 2
Frequency Table for Independent and Dependent Variables (N=271)

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<thead>
<tr>
<th>Variable</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>12</th>
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<tbody>
<tr>
<td>1. High School Rank</td>
<td></td>
<td>258</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. SCAT - Verbal</td>
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<td>216</td>
<td></td>
<td>229</td>
<td></td>
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<td></td>
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<tr>
<td>3. SCAT - Quantitative</td>
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<td>216</td>
<td>229</td>
<td>229</td>
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<td>4. Sex</td>
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<td>7. Overall GPA</td>
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<td>271</td>
<td>265</td>
<td>250</td>
<td>271</td>
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<td>8. Data Processing GPA</td>
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<td>10. Questionnaire Total Score*</td>
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<td>11. Questionnaire System Score*</td>
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<td>12. Questionnaire Programming Score*</td>
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</table>

*N = 116 for the graduate study sample.
Table 3

Step-Wise Multiple Regression Summary Table Predicting Overall College GPA from High School Rank, SCAT Quantitative Score, and SCAT Verbal Score for Data Processing Students

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables Entered</th>
<th>Multiple R</th>
<th>R Square</th>
<th>RSQ Change</th>
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<tr>
<td>1</td>
<td>High School Rank</td>
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<td>.251</td>
<td>.251</td>
</tr>
<tr>
<td>2</td>
<td>SCAT Quantitative Score</td>
<td>.542</td>
<td>.294</td>
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<td>3</td>
<td>SCAT Verbal Score</td>
<td>.551</td>
<td>.304</td>
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</tbody>
</table>

The final prediction equation generated by the step-wise multiple regression analysis was:

\[ y' = 1.504 + (0.947 \times \text{high school rank}) + (0.01 \times \text{SCAT verbal score}) + (0.013 \times \text{SCAT quantitative score}) \]  

As can be determined by looking at Table 3, the final equation with all three independent variables entered, reached a multiple correlation (R) of .551 with overall college GPA and accounted for approximately 30% of the variance in overall college academic achievement in the data processing program. Past research has indicated that the use of intellective variables such as high school rank and aptitude tests can account for 25 to 50% of the variance in predicting academic achievement (Lavin, 1965; Khan, 1969; and Price & Kim, 1976). It was decided that \( R^2 \geq 0.30 \) would be the decision rule for accepting or rejecting Hypotheses 1 and 2. The
results of this study were consistent with these findings. Using the
decision rule which was based on past research, Hypothesis 1 was
rejected. A predictive equation based on high school rank, SCAT
verbal score and SCAT quantitative score, did predict overall college
academic achievement as measured by GPA as well as past studies have
done.

Hypothesis 2. A predictive equation based on
rank in high school graduating class, SCAT
verbal score, and SCAT quantitative score
will not predict GPA in Ferris' data pro-
cessing major courses.

The decision rule for accepting or rejecting Hypothesis 2 is
\[ R^2 \geq 0.30. \]

By utilizing a step-wise multiple regression analysis for the
data processing student group (N=271) with the independent variable of
high school rank entered first in the step-wise regression and SCAT
quantitative score entered last in the regression, it was found that:

1. High school rank entered first with a multiple R of 0.384
and a multiple \( R^2 \) of 0.148.

2. SCAT quantitative score entered second with a multiple R of
0.4205, increasing the \( R^2 \) by only 0.029 to \( R^2 = 0.177 \).

3. SCAT verbal score did not enter the regression due to an
insufficient \( R^2 \).

A summary of these results is given in Table 4.

The final prediction equation generated by the step-wise regres-
sion analysis was:
Table 4
Step-Wise Multiple Regression Summary Table Predicting Data Processing GPA from High School Rank, SCAT Quantitative Score, and SCAT Verbal Score for Data Processing Students

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables Entered</th>
<th>Multiple R</th>
<th>R Square</th>
<th>RSQ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High School Rank</td>
<td>.384</td>
<td>.148</td>
<td>.148</td>
</tr>
<tr>
<td>2</td>
<td>SCAT Quantitative Score</td>
<td>.421</td>
<td>.177</td>
<td>.029</td>
</tr>
<tr>
<td>3</td>
<td>SCAT Verbal Score*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Increase in $R^2$ insufficient to enter.

$$y' = 1.157 + (1.136 \times \text{high school rank}) + (.020 \times \text{SCAT quantitative score}).$$

As can be determined by looking at Table 4, the final equation with two independent variables entered reached a multiple correlation ($R$) of .421 with data processing course GPA and accounted for approximately 18% of the variance in data processing courses achievement in Ferris' data processing baccalaureate program.

Past research has indicated that the use of intellective variables such as high school rank and aptitudes tests can account for 25 to 50 percent of the variance in predicting academic achievement (Lavin, 1865; Khan, 1969; Price & Kim, 1976). Larson (1970) conducted research at fifteen California junior colleges and found that high school grades and the American College Test (ACT) Composite Score were the best predictors of success in business data processing programs at the
junior college level. His regression analysis resulted in an $R^2$ of .34. The results of this study with an $R^2$ of .177 does not confirm these findings. Based on past research and the results of this research, Hypotheses 2 was not rejected. A predictive equation based on high school rank, SCAT verbal score and SCAT quantitative score did not predict data processing course academic achievement as measured by GPA as well as past studies have done.

Hypotheses 3 and 4

Hypotheses 3 and 4 were generated to test the predictive ability of the prediction equations generated for Hypotheses 1 and 2.

Hypothesis 3. The regression equation generated will not be useful in predicting success in the data processing curriculum as measured by overall college GPA.

In order to test Hypothesis 3, a contingency table of observed values was constructed (see Table 5), categorizing those students that graduated into two groups—those that had an overall college GPA of a 2.00 or greater and those with less than 2.00. The remainder of the Table categorized the dropouts into two groups—those with overall college GPA equal to or greater than 2.00 and those with less than 2.00.

Using the results of this classification, as depicted in Table 5, the relationship between category (graduates versus dropouts) and predicted overall college GPA was examined by constructing a chi square test of independence (Conover, 1980). The decision rule used for accepting or rejecting the null hypothesis was that if no relationship at

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Table 5
Contingency Table of Observed Values for Overall College GPA for Data Processing Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency GPA ≤ 2.00</th>
<th>Frequency GPA ≥ 2.00</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing Persistors</td>
<td>0</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>Data Processing Dropouts</td>
<td>2</td>
<td>127</td>
<td>129</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>214</td>
<td>216</td>
</tr>
</tbody>
</table>

the .05 level of significance is demonstrated, using the chi square test of independence, the null hypothesis will be accepted. If a relationship is found, this is evidence that the regression equation would be useful in predicting success in the data processing program as measured by overall college GPA. The data processing students were classified as indicated in Table 5. The decision rule was determined to be: if the \( x^2 (\text{calc}) > x^2 (\text{Table}) = 3.84 \).

The test statistic was calculated to be: \( x^2 = 1.3616 \). Since 1.3616 is less than 3.84, the null hypothesis was accepted. These results indicated very little or no relationship between category (graduates versus dropouts) and predicted overall college GPA at the .05 level of significance. This indicates that the generated prediction equation would not be useful in predicting overall college GPA.

Hypothesis 4. The regression equation generated will not be useful in predicting success in the data processing program as measured by data processing course GPA.

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In order to test Hypothesis 4, a contingency table of observed values was constructed (see Table 6), categorizing those students that graduated into two groups—those that had a data processing course GPA equal to 2.00 or greater and those with less than 2.00. The remainder of the Table categorized the dropouts into identical groups.

Table 6
Contingency Table of Observed Values for Data Processing GPA for Data Processing Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency GPA ≤ 2.00</th>
<th>Frequency GPA ≥ 2.00</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing Persistors</td>
<td>5</td>
<td>84</td>
<td>89</td>
</tr>
<tr>
<td>Data Processing Dropouts</td>
<td>23</td>
<td>106</td>
<td>129</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>190</td>
<td>218</td>
</tr>
</tbody>
</table>

Using the results of this classification, as depicted in Table 6, the relationship between category (graduates versus dropouts) and predicted data processing course GPA was examined by constructing a chi square test of independence. The decision rule used for accepting or rejecting the null hypothesis was that if no relationship at the .05 level of significance is demonstrated by using the chi square test of independence, the null hypothesis will be accepted. If a relationship is found, this is evidence that the regression equation would be useful in predicting success in the data processing program as measured by data processing course GPA.

The data processing students were classified as depicted in Table 6.
The decision rule was determined to be: if \( x^2(\text{calc}) > x^2(\text{table}) = 3.84 \).
The test statistic was calculated to be: \( x^2 = 7.015 \). Since 7.015 is
greater than 3.84, the null hypothesis was rejected. These results
indicate a relationship between category (graduates versus dropouts)
and predicted data processing course GPA at the .05 level of signifi-
cance. This indicates that the generated prediction equation would be
useful in predicting data processing course GPA.

The testing of Hypotheses 3 and 4 was done in an attempt to vali-
data the prediction equation generated in Hypotheses 1 and 2. Ideally
an independent group of data processing students would have been used
as the validation group. This was not possible for this study as data
was not available for a validation group. It was determined that the
validation technique utilized in Hypotheses 3 and 4 was the best approach
available.

Hypotheses 5 and 6

Hypotheses 5 and 6 were generated from the second research hypo-
thesis which stated that sex will be found to be a reliable predictor
of academic performance in Ferris State College's baccalaureate pro-
gram in data processing.

Hypothesis 5. There is no difference in final grade
point average in Ferris' data processing program
based on sex.

This hypothesis was tested by calculating the difference of the
means of the final grade point average for males and females for the
graduates of Ferris' B.S. program in data processing. The females'
mean GPA was found to be .1054 greater than the males'. This difference was tested for significance using the two independent sample t-test for means (Table 7). The difference was not found to be significant at the .05 level, having an actual probability of .277. On the basis of this finding, Hypothesis 5 was not rejected. No evidence was found to support differences by sex in final overall college grade point average for graduates of Ferris' B.S. program in data processing.

Hypothesis 6. There is no difference in grade point average between males and females in Ferris' data processing major courses based on sex.

This hypothesis was tested by calculating the difference of the means of the data processing major course grade point average for males and females for the graduates of Ferris' B.S. program in data processing. The mean for females was .0381 greater than the mean for males. This difference was tested for significance using the two independent sample t-test for means (Table 7). The difference was not found to be significant at the .05 level, having an actual probability of .744. On the basis of this finding, Hypothesis 6 was not rejected. No evidence was found to support differences by sex in data processing major grade point average for graduates of Ferris' B.S. program in data processing.

Hypothesis 7

Hypothesis 7 was generated from the third research hypothesis which stated that sex will be found to be a reliable predictor of data processing career success as determined by our employer rating.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>P (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall College GPA (Male)</td>
<td>90</td>
<td>3.15</td>
<td>3.99</td>
<td>1.87</td>
<td>.48</td>
<td>-1.08</td>
<td>61</td>
<td>.277</td>
</tr>
<tr>
<td>Overall College GPA (Female)</td>
<td>35</td>
<td>3.26</td>
<td>3.96</td>
<td>2.18</td>
<td>.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Processing GPA (Male)</td>
<td>90</td>
<td>3.13</td>
<td>4.00</td>
<td>1.67</td>
<td>.57</td>
<td>-0.31</td>
<td>57</td>
<td>.744</td>
</tr>
<tr>
<td>Data Processing GPA (Female)</td>
<td>35</td>
<td>3.17</td>
<td>4.00</td>
<td>1.81</td>
<td>.62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score Supervisor Questionnaire (Male)</td>
<td>82</td>
<td>3.64</td>
<td>4.76</td>
<td>1.73</td>
<td>.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score Supervisor Questionnaire (Female)</td>
<td>33</td>
<td>3.55</td>
<td>4.55</td>
<td>1.68</td>
<td>.63</td>
<td>.67</td>
<td>54</td>
<td>.485</td>
</tr>
</tbody>
</table>
Hypothesis 7. There is no difference in overall score on the Skills and Knowledge Assessment instrument between males and females.

This hypothesis was tested by calculating the difference of the means of the total score on the Skills and Knowledge Assessment instrument for males and females for graduates of Ferris' B.S. program in data processing. The female mean score was found to be .0848 less than the males'. This difference was tested for significance using the two independent sample t-test for means (Table 7). The difference was not found to be significant at the .05 level, having an actual probability of .485. On the basis of this finding, Hypothesis 7 was not rejected. There appears to be no difference between the scores of males and females on the Skills and Knowledge Assessment instrument for graduates of Ferris' B.S. program in data processing.

Hypotheses 8 and 9

Hypotheses 8 and 9 were generated from the fourth research hypothesis which stated that high school and college academic performance will be found to be a reliable predictor of dropout or persistence in Ferris' baccalaureate program in data processing.

Hypothesis 8. For students at the end of the second year of the data processing program, there is no difference between persistors and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English course grades, GPA for three
introductory data processing courses and sex.

This hypothesis was tested by calculating the difference of the means of the variables high school rank, SCAT verbal score, SCAT quantitative score, English course GPA, and grade point average for three introductory data processing courses for persistors and students that dropped out by the end of the second year. To test for differences based on the variable sex, the differences of the means of the previously cited variables were calculated for the male and female persistors and male and female dropouts.

For the variable high school rank, the persistors' mean score was found to be .0968 greater than the dropouts'. This difference was tested for significance using the independent sample t-test for means (Table 8). The difference was found to be significant at the .05 level, having an actual probability of .032.

For the variable SCAT verbal, the persistors' mean score was found to be 1.520 greater than the dropouts'. This difference was tested using the same t-test (Table 8). The difference was not found to be significant at the .05 level, having an actual probability of .381.

For the variable SCAT quantitative, the persistors' mean score was found to be 1.296 greater than the dropouts' mean score. Using the t-test (Table 8), the difference was not found to be significant at the .05 level, having an actual probability of .473.

For the variable English course grade point average, the persistors' mean GPA was found to be .466 greater than the dropouts' GPA. Using the same t-test, this difference was found to be significant at the...
Table 8
T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Persistors and Students That Dropped Out During Years One and Two

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>p (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Persistors</td>
<td>122</td>
<td>.71</td>
<td>.99</td>
<td>.24</td>
<td>.24</td>
<td>2.26</td>
<td>56</td>
<td>.032</td>
</tr>
<tr>
<td>High School Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Dropouts—Years One and Two</td>
<td>34</td>
<td>.61</td>
<td>.99</td>
<td>.27</td>
<td>.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Persistors</td>
<td>90</td>
<td>33.03</td>
<td>49.00</td>
<td>10.00</td>
<td>9.28</td>
<td>.95</td>
<td>81</td>
<td>.381</td>
</tr>
<tr>
<td>SCAT Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Dropouts—Years One and Two</td>
<td>37</td>
<td>31.51</td>
<td>49.00</td>
<td>18.00</td>
<td>7.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT Quantitative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Persistors</td>
<td>90</td>
<td>34.76</td>
<td>49.00</td>
<td>11.00</td>
<td>9.04</td>
<td>.70</td>
<td>64</td>
<td>.473</td>
</tr>
<tr>
<td>SCAT Quantitative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Dropouts—Years One and Two</td>
<td>37</td>
<td>33/46</td>
<td>50.00</td>
<td>10.00</td>
<td>9.62</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(continued)
Table 8 (concluded)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>p (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English GPA Student Persistors</td>
<td>123</td>
<td>2.95</td>
<td>4.00</td>
<td>1.67</td>
<td>.66</td>
<td>3.40</td>
<td>54</td>
<td>.000*</td>
</tr>
<tr>
<td>English GPA Student Dropouts—Years One and Two</td>
<td>37</td>
<td>2.49</td>
<td>4.00</td>
<td>1.00</td>
<td>.75</td>
<td>4.93</td>
<td>51</td>
<td>.000*</td>
</tr>
<tr>
<td>Introductory Data Processing Courses GPA Student Persistors</td>
<td>125</td>
<td>3.11</td>
<td>4.00</td>
<td>1.00</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introductory Data Processing Courses GPA Student Dropouts—Years One and Two</td>
<td>37</td>
<td>2.38</td>
<td>4.00</td>
<td>1.00</td>
<td>.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
.05 level, having an actual probability of 0.000 (Table 8).

For the variable, introductory data processing course grade point average, the persistors' mean GPA was found to be .730 greater than the dropouts'. This difference was found to be significant at the .05 level, having an actual probability of 0.000 (Table 8).

To summarize, for the variables high school rank, English GPA, and introductory data processing course GPA, there were found significant differences between persistors and dropouts. Therefore, if only these three variables were used, Hypothesis 8 would be rejected. However, for the variables SCAT verbal and SCAT quantitative there were found no significant differences between the mean scores of persistors and dropouts. If only these two variables were considered Hypotheses 8 would be accepted.

To test Hypothesis 8 for differences by sex, the differences of the means of the variables high school rank, SCAT verbal score, SCAT quantitative score, English course grade point average, and introductory data processing course grade point average for male and female persistors and male and female dropouts were tested for significance at the .05 level using the two independent sample t-test for means (Table 9 and Table 10).

For the variables high school rank and English grade point average, the female persistors were found to have significantly higher high school rank and English GPA than the male persistors. At the .05 level, the differences in the means were significant, having actual probabilities for high school rank of .000 and English GPA of .001 (Table 9).
Table 9

T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Male Persistors and Female Persistors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>p (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Rank Male Persistors</td>
<td>89</td>
<td>.66</td>
<td>.99</td>
<td>.13</td>
<td>.24</td>
<td>-4.40</td>
<td>88</td>
<td>.000</td>
</tr>
<tr>
<td>High School Rank Female Persistors</td>
<td>33</td>
<td>.83</td>
<td>.99</td>
<td>.38</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT Verbal Male Persistors</td>
<td>70</td>
<td>32.36</td>
<td>49.00</td>
<td>10.00</td>
<td>9.58</td>
<td>-1.45</td>
<td>37</td>
<td>.198</td>
</tr>
<tr>
<td>SCAT Verbal Female Persistors</td>
<td>20</td>
<td>35.40</td>
<td>48.00</td>
<td>19.00</td>
<td>7.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT Quantitative Male Persistors</td>
<td>70</td>
<td>34.63</td>
<td>49.00</td>
<td>11.00</td>
<td>9.07</td>
<td>-0.25</td>
<td>31</td>
<td>.805</td>
</tr>
<tr>
<td>SCAT Quantitative Female Persistors</td>
<td>20</td>
<td>35.20</td>
<td>49.00</td>
<td>22.00</td>
<td>9.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English GPA Male Persistors</td>
<td>89</td>
<td>2.84</td>
<td>4.00</td>
<td>1.67</td>
<td>.65</td>
<td>-3.48</td>
<td>65</td>
<td>.001*</td>
</tr>
<tr>
<td>English GPA Female Persistors</td>
<td>34</td>
<td>3.26</td>
<td>4.00</td>
<td>2.00</td>
<td>.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introductory Data Processing Courses GPA Male Persistors</td>
<td>90</td>
<td>3.10</td>
<td>4.00</td>
<td>1.75</td>
<td>.64</td>
<td>-0.15</td>
<td>55</td>
<td>.875</td>
</tr>
<tr>
<td>Introductory Data Processing Courses GPA Female Persistors</td>
<td>35</td>
<td>3/12</td>
<td>4.00</td>
<td>1.00</td>
<td>.73</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
Table 10

T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores English GPA, and Introductory Data Processing Courses GPA for Males That Dropped Out During Years One and Two and Females That Dropped Out During Years One and Two

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>p (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Dropouts---Years One and Two</td>
<td>28</td>
<td>.56</td>
<td>.89</td>
<td>.27</td>
<td>.20</td>
<td>-4.19</td>
<td>11</td>
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*Significant at the .05 level.
For the variables SCAT verbal, SCAT quantitative, and introductory data processing GPA, the differences in the means between female and male persistors were found to be not significant at the .05 level. The actual probability for SCAT verbal was .198, for SCAT quantitative was .805 and for introductory data processing GPA was .875 (Table 9).

For the variables high school rank and English GPA, the female dropouts were found to have significantly higher high school rank and English GPA than the male dropouts. The differences were significant at the .05 level, having actual probabilities for high school rank of .003 and English GPA of .028 (Table 10).

For the variables SCAT verbal, SCAT quantitative, and introductory data processing GPA, the differences in the means between male and female dropouts were found to be not significant at the .05 level. The actual probability for SCAT verbal was .069, for SCAT quantitative was .560 and for introductory data processing GPA was .961 (Table 10).

The female persistors and female dropouts had no significant differences on the variables high school rank, SCAT verbal, SCAT quantitative, English GPA and introductory data processing GPA at the .05 level of significance (Table 11).

The male persistors had significantly higher high school rank, English GPA, and introductory data processing GPA at the .05 level than did the male dropouts. At the .05 level, no significant difference was found for the variables SCAT verbal and SCAT quantitative (Table 12).

To summarize the research findings on the variable of sex as it pertains to Hypothesis 8, it appears that there is a difference based
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*Significant at the .05 level.
Table 12

T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Male Persistors and Males That Dropped Out During Years One and Two

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*Significant at the .05 level.
on sex between persistors and students that drop out of the data processing program during the first two years of the data processing program. The female persistors have significantly higher high school rank and English GPA than the male persistors. The female dropouts have significantly higher high school rank and English GPA than the male dropouts. There are no differences on any of the variables between female persistors and female dropouts. However, the male persistors have significantly higher high school rank, English GPA and introductory data processing GPA than does the male dropouts.

These research findings support the rejection of Hypothesis 8. There is a difference between persistors and dropouts based on sex.

Hypothesis 9. For students that finished the sophomore year but did not graduate at the end of the fourth year, there is no difference between persistors and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English GPA, GPA for three introductory data processing courses and sex.

This hypothesis was tested by calculating the difference of the means of the variables, high school rank, SCAT verbal score, SCAT quantitative score, English course GPA, and GPA for three introductory data processing courses for persistors and students that dropped out during the third and fourth years. To test for differences based on the variable sex, the difference of the means of the independent variables were calculated for the male and female persistors and male and female dropouts.
For the variable high school rank, the persistors' mean score was found to be .16 greater than the dropouts'. This difference was tested for significance using the independent sample t-test for means (Table 13). The difference was found to be significant at the .05 level, having an actual probability of 0.000.

For the variable SCAT verbal, the persistors' mean score was found to be 5.74 greater than the dropouts'. This difference was tested using the identical t-test (Table 13). The difference was found to be significant at the .05 level, having an actual probability of 0.000.

For the variable SCAT quantitative, the persistors' mean score was found to be 5.24 greater than the dropouts'. Using the previous t-test (Table 13), the difference was found to be significant at the .05 level, having an actual probability of 0.000.

For the variable English GPA, the persistors' mean GPA was found to be .55 greater than the dropouts'. This difference was found to be significant at the .05 level, having an actual probability of 0.000 (Table 13).

For the variable introductory data processing course GPA, the persistors' mean GPA was found to be 1.10 greater than the dropouts'. This difference was found to be significant at the .05 level, having an actual probability of 0.000 (Table 13).

To summarize, for the variables high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing course GPA, there were found significant differences between persistors and students that dropped out during the third and fourth year of the data processing program. Therefore, based on these findings, Hypothesis 9
Table 13
T-test of Data Processing Students’ High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Persistors and Students that Dropped Out During Years Three and Four

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<tr>
<td>Student Dropouts—Years Three and Four</td>
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<td>4.00</td>
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<td>.96</td>
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</table>

*Significant at the .05 level.
was rejected. Following is an analysis of the variable sex with regards to Hypothesis 9.

To test Hypothesis 9 for differences by sex, the differences of the means of the variables high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA for male and female persistors and male and female dropouts were tested for significance at the .05 level using the two independent sample t-test for means (Table 9, Table 14, Table 15, and Table 16).

The findings regarding differences between female persistors and male persistors were previously discussed for Hypothesis 8 and are reported in Table 9.

The female persistors were found to have significantly higher high school rank and English GPA. However, for the variables SCAT verbal and SCAT quantitative, and introductory data processing GPA, the differences between the female and male persistors were found to be not significant at the .05 level.

For the variables high school rank, English GPA, and introductory data processing GPA, the female dropouts were found to be significantly higher at the .05 level, than the male dropouts. The actual probabilities are high school rank equal to .00, English GPA equal to .13 and introductory data processing GPA equal to .001 (Table 14).

For the variables SCAT verbal and SCAT quantitative, the differences in the means between male and female dropouts were to be not significant at the .05 level. The actual probability for SCAT verbal was .158 and for SCAT quantitative was .056 (Table 14).

The female persistors had significantly higher high school rank,
Table 14
T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Males that Dropped Out During Years Three and Four and Females that Dropped Out During Years Three and Four

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>p (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Rank, Male Dropouts--Years Three and Four</td>
<td>63</td>
<td>.46</td>
<td>1.00</td>
<td>.04</td>
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<td>-5.24</td>
<td>84</td>
<td>.000*</td>
</tr>
<tr>
<td>High School Rank, Female Dropouts--Years Three and Four</td>
<td>39</td>
<td>.70</td>
<td>.96</td>
<td>.20</td>
<td>.22</td>
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</tr>
<tr>
<td>SCAT Verbal Male Dropouts--Years Three and Four</td>
<td>63</td>
<td>26.44</td>
<td>53.00</td>
<td>11.00</td>
<td>8.26</td>
<td>-1.44</td>
<td>89</td>
<td>.168</td>
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<td>SCAT Verbal Female Dropouts--Years Three and Four</td>
<td>39</td>
<td>28.67</td>
<td>40.00</td>
<td>14.00</td>
<td>7.16</td>
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<tr>
<td>SCAT Quantitative Male Dropouts--Years Three and Four</td>
<td>63</td>
<td>28.05</td>
<td>48.00</td>
<td>4.00</td>
<td>9.82</td>
<td>-1.94</td>
<td>82</td>
<td>.056</td>
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<tr>
<td>SCAT Quantitative Female Dropouts--Years Three and Four</td>
<td>39</td>
<td>31.90</td>
<td>50.00</td>
<td>11.00</td>
<td>9.69</td>
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(continued)
Table 14 (concluded)

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<th>Maximum</th>
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<th>Standard Deviation</th>
<th>T Value</th>
<th>df</th>
<th>( p ) (two-tailed)</th>
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<tbody>
<tr>
<td>English GPA, Male Dropouts—Years Three and Four</td>
<td>63</td>
<td>2.28</td>
<td>4.00</td>
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<td>.58</td>
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<tr>
<td>English GPA, Female Dropouts—Years Three and Four</td>
<td>42</td>
<td>2.59</td>
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<td>.50</td>
<td>.66</td>
<td>-2.47</td>
<td>80</td>
<td>.13</td>
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<td>51</td>
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<td>.88</td>
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<td>Introductory Data Processing Courses GPA, Female Dropouts—Years Three and Four</td>
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<td>1.00</td>
<td>.92</td>
<td>-3.56</td>
<td>76</td>
<td>.001*</td>
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</table>

*Significant at the .05 level.
SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA at the .05 level, than did the female dropouts (Table 15).

The male persistors had significantly higher high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA at the .05 level, than did the male dropouts (Table 16).

To summarize the research findings on the variables of sex as it pertains to Hypothesis 9, it appears that there is a difference based on sex between persistors and students that drop out of the data processing program during the third and fourth years of the program. The female persistors have a significantly higher high school rank and English GPA than the male persistors. The female dropouts have a significantly higher high school rank, English GPA, and introductory data processing GPA than the male dropouts. The male persistors were significantly higher than the male dropouts on all of the variables (Table 16). However, the female persistors were not higher than the female dropouts on the variable SCAT quantitative (Table 15).

There were several differences found that were related to sex. Therefore, these research findings support the rejection of Hypothesis 9. There is a difference between persistors and students that drop out during the third and fourth years based on sex.

Hypotheses 10, 11 and 12

Hypotheses 10, 11 and 12 were generated from the fifth research hypothesis which stated that high school and college academic performance will be found to be correlated with career success for graduates of Ferris' baccalaureate program in data processing.
Table 15

T-test of Data Processing Students' High School Rank, SCAT Verbal and Quantitative Scores, English GPA, and Introductory Data Processing Courses GPA for Female Persistors and Females that Dropped Out During Years Three and Four

<table>
<thead>
<tr>
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<th>Number</th>
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<th>Minimum</th>
<th>Standard Deviation</th>
<th>T Value</th>
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<td>.16</td>
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<td>.70</td>
<td>.96</td>
<td>.20</td>
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<td>48.00</td>
<td>19.00</td>
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<td>.007*</td>
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<td>28.67</td>
<td>40.00</td>
<td>14.00</td>
<td>7.16</td>
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<tr>
<td>SCAT Quantitative</td>
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(continued)
Table 15 (concluded)

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<th>T Value</th>
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<th>p   (two-tailed)</th>
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*Significant at the .05 level.
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<th>T Value</th>
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<th>p (two-tailed)</th>
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<td>3.82</td>
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<td>11.00</td>
<td>8.26</td>
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<td>Male Dropouts--Years Three and Four</td>
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<td>11.00</td>
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<td>Male Persistors</td>
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<tr>
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<td>Male Dropouts--Years Three and Four</td>
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(continued)
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<th>Maximum</th>
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<th>Standard Deviation</th>
<th>T Value</th>
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<td>2.28</td>
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<td>.58</td>
<td>5.57</td>
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<td>1.75</td>
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<td>.88</td>
<td>9.87</td>
<td>80</td>
<td>.000*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
Hypothesis 10. High school rank, SCAT verbal score, SCAT quantitative score, overall college GPA, GPA in the data processing major courses, and English GPA will not be correlated with the score in the systems analysis section of the Skills and Knowledge Assessment instrument.

This hypothesis was tested at the .05 level by calculating a Pearson product-moment correlation between the systems analysis score on the Skills and Knowledge Assessment instrument and each of the cited independent variables (Table 17). Referring to Table 17, variables 1, 2, 3, 5, 7 and 8 were each respectively paired with variable 11 for purposes of calculating correlation coefficients. The n's associated with the variable in Table 17 were given in Table 2.

By referring to Table 18, it can be seen that the variables high school rank, SCAT verbal, SCAT quantitative, and English GPA have no significant correlation with the systems analysis score on the Skills and Knowledge Assessment instrument. With r values of .24 for overall college GPA and .23 for data processing GPA; it is evident that the variables overall college GPA and data processing GPA have a significant correlation with the systems analysis score at the .05 level. However, using a previously cited decision rule that says $R^2$ should be at least .30 at the .05 level, then it is evident that overall college GPA and data processing GPA do not have a strong relationship with the systems analysis score. The r value for overall college GPA is .24 and should be at least .50 to satisfy the decision rule. Similarly, the r value for data processing GPA is .23 and should also be at least .23...
Table 17

Intercorrelation Matrix of Independent Variables for Independents with College Performance and Career Success of Data Processing Students

<table>
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<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
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<td></td>
</tr>
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<td>2. SCAT - Verbal</td>
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<tr>
<td>3. SCAT - Quantitative</td>
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<td>.61*</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>4. Sex</td>
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<td>.10</td>
<td>.07</td>
<td>1.00</td>
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<td></td>
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</tr>
<tr>
<td>5. English GPA</td>
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<td>.38*</td>
<td>.37*</td>
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<tr>
<td>6. Intro. Data Processing GPA</td>
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<td>.36*</td>
<td>.08</td>
<td>.41*</td>
<td>1.00</td>
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<tr>
<td>7. Overall GPA</td>
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<td>.45*</td>
<td>.43*</td>
<td>.13</td>
<td>.60*</td>
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<td>8. Data Processing GPA</td>
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<td>.31*</td>
<td>.34*</td>
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<td>.93*</td>
<td>.84*</td>
<td>1.00</td>
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<td>9. Dropout Code</td>
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<td>-.12</td>
<td>-.01</td>
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<td>-.43*</td>
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</tr>
<tr>
<td>11. Questionnaire System Score</td>
<td>-.03</td>
<td>-.02</td>
<td>-.06</td>
<td>-.07</td>
<td>.00</td>
<td>.22*</td>
<td>.24*</td>
<td>.23*</td>
<td>.00</td>
<td>.88*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Questionnaire Programming Score</td>
<td>.02</td>
<td>.12</td>
<td>.10</td>
<td>.09</td>
<td>.06</td>
<td>.14</td>
<td>.16</td>
<td>.17</td>
<td>.00</td>
<td>.82*</td>
<td>.65*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>13. Questionnaire Human Relations Score</td>
<td>.03</td>
<td>.01</td>
<td>-.04</td>
<td>.01</td>
<td>.04</td>
<td>.17</td>
<td>.17</td>
<td>.18</td>
<td>.00</td>
<td>.86*</td>
<td>.73*</td>
<td>.51*</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Significantly different from 0 at the .05 level.
Table 18
Matrix of Correlation Data for Hypothesis 10*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficient $r$</th>
<th>n</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High School Rank</td>
<td>-.03</td>
<td>112</td>
<td>.186</td>
</tr>
<tr>
<td>2. SCAT Verbal</td>
<td>-.02</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>3. SCAT Quantitative</td>
<td>-.06</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>4. Overall College GPA</td>
<td>.24**</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>5. Data Processing GPA</td>
<td>.23**</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>6. English GPA</td>
<td>.00</td>
<td>114</td>
<td>.184</td>
</tr>
</tbody>
</table>

*Systems analysis score is dependent variable.
**Significantly different from 0 at the .05 level.

.50. On the basis of these results, Hypothesis 10 was not rejected.

Hypothesis 11. High school rank, SCAT verbal score, SCAT quantitative score, overall college GPA, GPA average in the data processing major courses and English GPA will not be correlated with the score in the programming section of the Skills and Knowledge Assessment instrument.

This hypothesis was tested at the .05 level by calculating a Pearson product-moment correlation between the programming score on the Skills and Knowledge Assessment instrument and each of the cited independent variables (Table 17). Referring to Table 17, variables 1, 2, 3, 5, 7 and 8 were each respectively paired with variable 12 for purposes of calculating correlation coefficients.
By referring to Table 19, it can be seen that none of the variables have a significant correlation at the .05 level with the programming score. On the basis of these results, Hypothesis 11 was not rejected.

Table 19
Matrix of Correlation Data for Hypothesis 11*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficient r</th>
<th>n</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High School Rank</td>
<td>.02</td>
<td>112</td>
<td>.186</td>
</tr>
<tr>
<td>2. SCAT Verbal</td>
<td>.12</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>3. SCAT Quantitative</td>
<td>.10</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>4. Overall College GPA</td>
<td>.16</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>5. Data Processing GPA</td>
<td>.17</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>6. English GPA</td>
<td>.06</td>
<td>114</td>
<td>.184</td>
</tr>
</tbody>
</table>

*Programming score is dependent variable.

Hypothesis 12. High school rank, SCAT verbal score, SCAT quantitative score, overall college GPA, GPA in the data processing major courses and English GPA will not be correlated with the score in the human relations section of the Skills and Knowledge Assessment instrument.

This hypothesis was tested at the .05 level by calculating a Pearson product-moment correlation between the human relations score on the Skills and Knowledge Assessment instrument and each of the cited variables (Table 17). Referring to Table 17, variables 1, 2, 3, 5, 7 and 8 were each respectively paired with variable 13 for purposes.
of calculating correlation coefficients.

By referring to Table 20, it can be seen that none of the variables have a significant correlation at the .05 level with the human relations score. On the basis of these results, Hypothesis 12 was not rejected.

Table 20
Matrix of Correlation Data for Hypothesis 12*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficient r</th>
<th>n</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High School Rank</td>
<td>.03</td>
<td>112</td>
<td>.186</td>
</tr>
<tr>
<td>2. SCAT Verbal</td>
<td>.01</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>3. SCAT Quantitative</td>
<td>-.04</td>
<td>81</td>
<td>.219</td>
</tr>
<tr>
<td>4. Overall College GPA</td>
<td>.17</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>5. Data Processing GPA</td>
<td>.18</td>
<td>115</td>
<td>.183</td>
</tr>
<tr>
<td>6. English GPA</td>
<td>.04</td>
<td>114</td>
<td>.184</td>
</tr>
</tbody>
</table>

*Human relations score is dependent variable.

Supervisor Profile

In addition to completing the Skills and Knowledge Assessment instrument, the supervisors of the data processing graduates completed a profile questionnaire. This is exhibited in Appendix F. The information collected on the supervisors was summarized with means calculated for the various categories (Table 21).

The profile of the typical supervisor depicts a person that is 37 years old, with 13.5 years of data processing experience (six years of
which have been in supervision), and is currently in a data processing operation of 74 people. The graduate has typically been supervised by their current supervisor for 1.7 years.

Table 21
Profile of a Typical Graduate's Supervisor

<table>
<thead>
<tr>
<th>Descriptive Category</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Supervisor</td>
<td>37.32</td>
</tr>
<tr>
<td>Years of Data Processing Experience</td>
<td>13.47</td>
</tr>
<tr>
<td>Years of Data Processing Supervision</td>
<td>6.4</td>
</tr>
<tr>
<td>Number of Data Processing Personnel in Center</td>
<td>74.45</td>
</tr>
<tr>
<td>Years Supervised by Current Supervisor</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Summary

This study examined twelve experimental hypotheses for students enrolled during the years 1972-1978 in Ferris State Colleges' B.S. program in data processing. These hypotheses and their rejection or non-rejection, based on $\alpha = .05$, are summarized in Table 22.

The analysis of data in this chapter suggested several conclusions concerning the predictability of both academic success for students in Ferris State Colleges' B.S. program in data processing and career success in data processing by graduates of the same program. Further, admissions procedures are warranted in order to minimize student attrition. These conclusions and implications as well as recommendations for further research, are presented in Chapter V.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
<th>Result of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prediction of overall college GPA</td>
<td>Rejected</td>
</tr>
<tr>
<td>2</td>
<td>Prediction of data processing GPA</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>3</td>
<td>Validation of Hypothesis 1 prediction equation</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>4</td>
<td>Validation of Hypothesis 2 prediction equation</td>
<td>Rejected</td>
</tr>
<tr>
<td>5</td>
<td>Sex differences for overall college GPA</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>6</td>
<td>Sex differences for data processing GPA</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>7</td>
<td>Sex differences for career success</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>8</td>
<td>Dropouts versus persistors at end of second year</td>
<td>Rejected</td>
</tr>
<tr>
<td>9</td>
<td>Dropouts versus persistors at end of fourth year</td>
<td>Rejected</td>
</tr>
<tr>
<td>10</td>
<td>High school and college academic performance correlation with career success in systems analysis</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>11</td>
<td>High school and college academic performance correlation with career success in computer programming</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>12</td>
<td>High school and college academic performance correlation with human relations skills as a part of career success.</td>
<td>Not Rejected</td>
</tr>
</tbody>
</table>
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This study examined the contributions of the SCAT aptitude test, high school rank, college academic performance and sex as predictors of academic success in Ferris State College's baccalaureate program in data processing and career success for graduates of this program. Not much attention has been given to which students have succeeded in Ferris' data processing program. Recently the tremendous demand by industry for graduates of data processing programs has resulted in a corresponding demand on the part of prospective students applying for admission to Ferris' program. This large demand together with declining resources for higher education has resulted in the need for ways to reduce the attrition out of the data processing program at Ferris. Attrition results in a great amount of wasted resources. If those students, who are likely not to succeed in Ferris' data processing program or in a data processing career, can be identified, then a much more effective job of advising can be done. This should result in more effective use of college resources.

Literally thousands of studies have been done in the attempt to predict academic success. Fewer studies have been done to predict career success. These academic success studies have primarily dealt with college success in general and not with specific programs. Of the
few studies that dealt with specific programs, only a few were for
data processing programs. Of the studies concerning academic success
in data processing, none were found for baccalaureate level programs.
Furthermore, no studies were found dealing with predicting career
success for graduates of a baccalaureate program in data processing.
The study was conducted to provide information to be used in reducing
attrition from Ferris State College's B.S. program in data processing
and to add to the available research in predicting academic and career
success in data processing.

Purpose of the Study

This research was undertaken to add to the knowledge base of data
processing education at the undergraduate level and to develop a tool
to be used in improving the productivity of undergraduate programs in
data processing. The study was concerned with predicting success in
Ferris State College's B.S. program in data processing and career suc-
cess in data processing for graduates of this program. The study has
two primary purposes. First, to determine the combined contribution of
three predictors: high school rank, SCAT verbal and quantitative scores,
as they relate to academic success in the data processing B.S. program.
Second, to determine the combined contribution of six predictors: high
school rank, SCAT verbal and quantitative scores, overall college grade
point average, grade point average in the data processing major courses,
and English grade point average, as they relate to career success in
data processing for graduates of Ferris State College's B.S. program
in data processing. As part of this research, other aspects studied:
1. The effect of sex on grade point average in Ferris' data processing program.

2. The effect of sex on grade point average in Ferris' major data processing courses.

3. The effect of sex on career success in data processing.

4. The ability of high school and college academic performance to predict persistors or dropouts in Ferris' baccalaureate program in data processing.

Summary of Procedures

Phase One—Academic Success

This phase of the study attempted to determine if selected high school and aptitude test data could be used to predict academic achievement in Ferris' B.S. program in data processing. Past research indicates high school data and aptitude tests when taken collectively, can account for a large amount of variance in college academic success. The predictor variables of high school rank, SCAT verbal and SCAT quantitative scores were chosen due to availability of data and their likelihood of predicting as past research indicates.

Academic success was defined as graduation from Ferris' B.S. program in data processing with a GPA of 2.00 or greater. The sample population for phase one of the study was composed of 125 B.S. data processing graduates and 146 dropouts from this program.

Phase Two—Career Success

The final graduate sample size was 121 graduates of Ferris' B.S.
program in data processing for the years 1976, 1977 and 1978. The very limited amount of research relating to predicting career success is primarily related to college graduates in general and not specific programs such as data processing. However, of the research that has been done, high school data as well as college course grades have been used most frequently in prediction studies. A measure of career success was taken by having the graduates' supervisor complete a Skills and Knowledge Assessment instrument developed for this study. In addition, supervisor data was collected from the supervisor to build a profile.

Based on statistical analyses and a review of the literature, twelve experimental hypotheses related to academic achievement and career success in data processing were tested:

Hypothesis 1—A predictive equation based on rank in high school graduating class, School and College Ability Test (SCAT) verbal score, and SCAT quantitative score will not predict overall grade point average in Ferris' Data Processing baccalaureate program.

Hypothesis 2—A predictive equation based on rank in high school graduating class, School and College Ability Test verbal score, and SCAT quantitative score will not predict grade point average in Ferris' data processing major courses.

Hypothesis 3—The regression equation generated will not be useful in predicting success in the data processing curriculum as measured by overall college grade point average.

Hypothesis 4—The regression equation generated will not be useful in predicting success in the data processing program as measured by data processing course grade point average.

Hypothesis 5—There is no difference in grade point average in Ferris' data processing program based on sex.

Hypothesis 6—There is no difference in grade point average between males and females in Ferris' data processing major courses based on sex.
Hypothesis 7—There is no difference in overall score on the Skills and Knowledge Assessment instrument between males and females.

Hypothesis 8—For students at the end of the second year of the data processing program, there is no difference between persistors and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English course grades, grade point average for three introductory data processing courses and sex.

Hypothesis 9—For students that finished the sophomore year but did not graduate at the end of the fourth year, there is no difference between persistors and dropouts on the basis of high school rank, SCAT verbal score, SCAT quantitative score, English grade point average, grade point average for three introductory data processing courses and sex.

Hypothesis 10—High school rank, SCAT verbal score, SCAT quantitative score, overall college grade point average, grade point average in the data processing major courses, and English grade point average will not be correlated with the score in the systems analysis section of the Skills and Knowledge Assessment instrument.

Hypothesis 11—High school rank, SCAT verbal score, SCAT quantitative score, overall college grade point average, grade point average in the data processing major courses and English grade point average will not be correlated with the score in the programming section of the Skills and Knowledge Assessment instrument.

Hypothesis 12—High school rank, SCAT verbal score, SCAT quantitative score, overall college grade point average, grade point average in data processing major courses and English grade point average will not be correlated with the score in the human relations section of the Skills and Knowledge Assessment instrument.

The statistical analysis procedures used to test the twelve experimental hypotheses are fully described in Chapter III. In summary, the Biomedical (BMD) statistical package and Ferris State College's computer facilities were used with the following subprograms: step-wise multiple regression, t-test for independent means, chi-square, and correlation.
Findings

The study findings relating to all twelve hypotheses are discussed in the following paragraphs. The findings of the study are as follows.

Academic Success

Prediction equations based on high school rank and SCAT quantitative and verbal scores were generated for prediction of success in Ferris' B.S. program in data processing and of success in the data processing major courses (Hypotheses 1, 2, 3 and 4).

The study findings would seem to suggest that high school rank, SCAT quantitative and verbal scores would be as reliable in predicting success in the B.S. data processing program (Hypothesis 1) as past studies. This regression equation accounted for 30% of the variance in overall college academic achievement. Past research finds that these types of intellectual variables generally account for 25 to 50% of the variance in predicting academic achievement (Lavin, 1965; Khan, 1969; Price & Kim, 1976). However, the results of the study provided no support for using high school rank, SCAT verbal and SCAT quantitative for predicting academic success in the data processing major courses (Hypothesis 2). The regression equation accounted for 18% of the variance in academic achievement in data processing courses.

The findings related to Hypotheses 1 and 2 were not consistent with the findings resulting from the testing of the generated prediction equations for validity (Hypotheses 3 and 4). In order to test the reliability of the generated prediction equation for overall college
success, a contingency table of observed values was constructed, categ-
gorizing the students by final GPA and whether graduate or dropout
(Table 5). The relationship between category (graduates versus drop-
outs) and predicted overall college GPA was examined by constructing
a chi-square test of independence (Conover, 1980).

The results of the chi-square test indicate that the generated pre-
diction equation (Hypothesis 1) cannot reliably predict overall college
academic success in Ferris' B.S. program in data processing. Although,
the amount of variance accounted for in the multiple regression analysis
was within the range of the majority of past research.

The results of the chi-square test for the prediction equation
generated for Hypothesis 2, indicates that this prediction equation has
some degree of validity in predicting academic success in data process-
ing courses. This is not consistent with the results of the findings
of the multiple regression analysis done for Hypothesis 2, which was
below the acceptable range of accounting for 25 to 50% of the variance.

In summary, the chi-square test utilized to test Hypotheses 3 and
4 resulted in findings not consistent with the analysis results of
Hypotheses 1 and 2. This inconsistency in results could be due to
several factors. One reason for this could be due to the small expected
frequencies. Conover (1980) indicates when one of the expected fre-
quencies is less than one (1), the chi-square test tends to be unstable.
Table 5 has an expected frequency in one cell less than one (1). How-
ever, Table 6 does not have any cells less than one (1). The results
of the chi-square test for Table 5 probably would have been stable had
there been more cases available.
Another reason for the inconsistent results might be the fact that students might be dropping out of the data processing program for non-data processing reasons. Another explanation might be the fact that the hypothesis dealing with the data processing major GPA is much more specific rather than the broader based overall college GPA.

Sex

Graduates of Ferris' B.S. program in data processing were compared by sex to determine whether sex made any difference in final college GPA (Hypothesis 5). There was no evidence to support sex as a difference in final overall college GPA for graduates of Ferris' B.S. program in data processing.

Similarly, the findings provided no evidence to support sex as a difference in the data processing major GPA for graduates of Ferris' B.S. program in data processing (Hypothesis 5).

Finally, the study found no evidence to support sex as a difference in the overall score on the Skills and Knowledge Assessment instrument, a measure of Ferris' B.S. data processing graduate's career success (Hypothesis 7).

In summary, in all cases, no evidence was found to support sex as a difference in overall college GPA, data processing GPA and in success in the data processing field for graduates of Ferris' B.S. program in data processing.

Dropouts VersusPersistors

The study defined two types of dropouts and persistors. The first
were those students that either dropped out by the second year of the program or started the third year. The second were those students that either dropped out during the third and fourth years or graduated from the B.S. program in data processing.

**Dropouts versus persistors—Type 1.** The means of the variables high school rank, SCAT verbal score, SCAT quantitative score, English GPA, and GPA for three introductory data processing courses for persistors and students that dropped out by the end of the second year were tested for significant differences at the .05 level using the two independent sample t-test for means (Hypothesis 8).

The study found that, at the end of the second year in Ferris B.S. program in data processing, persistors were found to be significantly different than dropouts with respect to high school rank, English GPA, and introductory data processing GPA. But persistors were not found to be significantly different than dropouts with respect to SCAT verbal scores and SCAT quantitative scores.

In order to determine if there were any differences between persistors and dropouts at the end of the second year based on sex, the differences in means of the variables high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA for male and female persistors and male and female dropouts were tested for significance at the .05 level using the two independent sample t-test for means (Hypothesis 8).

Female persistors were found to have significantly higher high school rank and English GPA than the male persistors. But female persistors were not found to differ significantly from male persistors.
with respect to SCAT verbal, SCAT quantitative, and introductory data processing GPA.

Female dropouts were found to have a significantly higher high school rank and English GPA than the male dropouts. But female dropouts were not found to differ significantly from male dropouts with respect to SCAT verbal, SCAT quantitative, and introductory data processing GPA.

Female persistors were not found to differ significantly from female dropouts with respect to high school rank, SCAT verbal, SCAT quantitative, English GPA and introductory data processing GPA. However, male persistors were found to have significantly higher high school rank, English GPA, and introductory data processing GPA than the male dropouts. But, male persistors were not found to differ significantly from male dropouts with respect to SCAT verbal scores and SCAT quantitative scores.

To summarize the findings with respect to the variable of sex for dropouts and persistors at the end of the second year of Ferris' B.S. program in data processing, it appears that there are significant differences based on sex. In both the persistor and dropout category, the female appears to have higher high school rank and English GPA.

Dropouts versus persistors--Type 2. The means of the variables high school rank, SCAT verbal score, SCAT quantitative score, English GPA and introductory data processing GPA for persistors (graduates) and dropouts that finished the sophomore year but did not graduate were tested for significant differences at the .05 level using the two independent sample t-test for means (Hypothesis 9).
The study found that, at the end of the fourth year of Ferris B.S. program in data processing, persistors were found to be significantly different than third and fourth year dropouts with respect to high school rank, SCAT verbal, SCAT quantitative, English GPA and introductory data processing GPA.

In order to determine if there were any differences between persistors and third and fourth year dropouts based on sex, the differences in means of the variables high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA for male and female persistors and male and female dropouts were tested for significance at the .05 level using the two independent sample t-test for means (Hypothesis 9).

Female persistors were found to have significantly higher high school rank and English GPA than the male persistors. But female persistors were not found to differ significantly from male persistors with respect to SCAT verbal, SCAT quantitative, and introductory data processing GPA.

Female dropouts were found to have a significantly higher high school rank, English GPA and introductory data processing GPA than the male dropouts. But female dropouts were not found to differ significantly from male dropouts with respect to SCAT verbal and SCAT quantitative.

Female persistors were found to have significantly higher high school rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA than the female dropouts. Similarly, the male persistors were found to have significantly higher high school
rank, SCAT verbal, SCAT quantitative, English GPA, and introductory data processing GPA than the male dropouts.

To summarize the findings with respect to the variable sex and fourth year dropouts of Ferris' B.S. program in data processing, it appears that there are significant differences based on sex. In both the persistor and dropout category the female appears to have higher high school rank and English GPA.

Career Success

Career success, as determined by the graduate's supervisor rating on the Skills and Knowledge Assessment instrument, was found to not be significantly correlated with high school and college academic performance.

The Skills and Knowledge Assessment instrument has three parts (systems analysis, computer programming and human relations) with each part having a score. The graduate's supervisor rated the graduate in each of the three areas. The scores for each of the three areas were tested to see if there was any relationship between the graduates job performance and the graduate's high school and college academic performance. No significant relationships were found.

Systems analysis. High school and college academic performance as determined by high school rank, SCAT verbal, SCAT quantitative and English GPA, was found to be not significantly correlated at the .05 level with the systems analysis score on the Skills and Knowledge Assessment instrument (Hypothesis 10). Although overall college GPA and data processing GPA were found to be significantly correlated with
the systems analysis score at the .05 level, the strength of the relationship does not appear to be very strong with correlation coefficients of .24 and .23 respectively.

Computer programming. High school and college academic performance as determined by high school rank, SCAT verbal, SCAT quantitative, overall college GPA, GPA in the data processing major courses, and English GPA was found to be not significantly correlated at the .05 level with the computer programming score on the Skills and Knowledge Assessment instrument (Hypothesis 11).

Human relations. High School and college academic performance as determined by high school rank, SCAT verbal, SCAT quantitative, overall college GPA, GPA in the data processing major courses, and English GPA was found to be not significantly correlated at the .05 level with the human relations score on the Skills and Knowledge Assessment instrument (Hypothesis 12).

In the three major areas of success that were tested, it was found that career success as measured by the subscores on the Skills and Knowledge Assessment instrument was not related to high school and college academic performance.

Implications and Conclusions

From five research hypotheses, twelve experimental hypotheses were developed for and tested by this investigation of data processing success for students enrolling in Ferris State College's B.S. program in data processing. The following discussion is concerned with the conclusions reached for each of the five research hypotheses.
Research Hypothesis I

High school academic performance as determined by high school class rank and aptitude test scores will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing. It was concluded that academic success in Ferris' data processing major courses could be reliably predicted by high school class rank and the SCAT quantitative score. SCAT verbal did not contribute to the predictive equation due to an insufficient $R^2$ value.

With respect to academic success as measured by graduating from Ferris' B.S. data processing program, it was concluded that academic success could not be reliably predicted by high school class rank, SCAT verbal score and SCAT quantitative score.

This has implications with respect to the third objective of this study which is: to provide information that can be used by Ferris State College's Counseling Center to design strategies for recruiting students with the greatest probability of achieving success in Ferris' data processing program and in a data processing career.

The findings would seem to imply that academic counselors could, with caution and some limitations, provide prospective students advice as to their likelihood of being successful in Ferris' data processing major courses. However, caution would be needed in terms of translating this advice into probability of success in the overall college program in data processing.
Research Hypothesis II

Sex will be found to be a reliable predictor of academic performance in Ferris State College's baccalaureate program in data processing. With respect to graduates of Ferris' B.S. program in data processing, no evidence was found to support sex as a difference in overall college GPA. Similarly, no evidence was found to support sex as a difference in GPA for data processing major courses.

With respect to dropouts versus persistors, no evidence was found to support sex as a difference in GPA for introductory courses in data processing. However, it was also concluded based on the findings, that there was no evidence to support differences by sex with respect to high school class rank and college English GPA.

These findings seem to imply that, although females entering Ferris' data processing program tended to have higher high school class rank and were more successful in college English courses, and were not more successful than males in the data processing courses, other factors such as personal motivation, personality, and student selection factors appear to be responsible for success in the data processing courses at Ferris State College.

The findings of this study are not consistent with several of the studies related to data processing education (Larson, 1970; Gray, 1974). However, other data processing prediction studies had findings consistent with this study (Buff, 1972; Sando, 1973).

Ferris' B.S. program in data processing is experiencing a greater and greater proportion of females. It would seem that the differences between females and males with respect to career objectives might be
disappearing as the field of data processing matures. Further research with respect to sex differences in data processing education and careers is needed.

Research Hypothesis III

Sex will be found to be a reliable predictor of data processing career success as determined by an employer rating. It was concluded that no evidence was found to support differences by sex in data processing career success. This had implications for the third major purpose of this study, which is to provide information that can be used by Ferris State College's counselors, advisors, and faculty to design strategies for recruiting students with the greatest probability of achieving success in Ferris' data processing program and in a data processing career. Prospective female students can be assured through counseling of their having as much probability of career success as the male student. This is an important consideration for student recruiting. As the college age student population declines, more and more female students enter into these programs. The findings of this study, will provide information that could be effective in recruiting female students into Ferris State College's B.S. program in data processing.

Research Hypothesis IV

High school and college academic performance as determined by course grades received in selected data processing and college English courses will be found to be a reliable predictor of a dropout in Ferris'
baccalaureate program in data processing. It was concluded that at the end of the second year in Ferris' B.S. program in data processing, persistors have a higher high school class rank, college English GPA and introductory data processing GPA. But with respect to SCAT verbal and quantitative scores, there is support for differences between persistors and dropouts.

At the end of the fourth year of Ferris' B.S. program in data processing, it was concluded that persistors have higher high school ranks, SCAT verbal and quantitative scores, college English GPA and introductory data processing GPA, than do third and fourth year dropouts.

These findings and conclusions have implications for student recruiting, admissions and advising. The results of this study provide the basis from which recruiting, admissions and advising plans can be developed. These plans and procedures need to be developed to provide advisors, counselors, and faculty with more and better information available, thus enabling them to better advise students as to their probability of success in the data processing program. Weak students can then be identified and informed of their need to work very hard in order to succeed academically in the data processing program.

The academic department of data processing and the admissions office will have better information available for formulating student recruiting strategies. A recruiting strategy can be developed that looks for prospective students with a high high school rank, high SCAT verbal and quantitative scores, high English GPA and introductory data processing GPA. The college English GPA and introductory data processing GPA would be more appropriately utilized for transfer
students rather than first time college students.

Finally, the academic department can utilize these findings in defining and implementing additional admissions criteria. Rather than just high school or college GPA as an admissions requirement, high school rank, SCAT verbal, SCAT quantitative, English GPA and introductory data processing GPA can be considered for admissions criteria.

Research Hypothesis V

High school and college academic performance as determined by high school class rank, aptitude test scores, course grades received in selected college data processing and English courses will be found to be a reliable predictor of career success for graduates of Ferris' baccalaureate program in data processing.

It was concluded that there was not sufficient evidence to support the use of high school rank, SCAT verbal and quantitative scores, college English GPA, and introductory data processing GPA to predict data processing career success for graduates of Ferris' B.S. program in data processing.

In summary, these findings have implications related to the development of recruiting strategies and plans for the admissions office and the academic department, as well as for advising and counseling students already admitted to the data processing program. These findings have implications for further research in identifying variables that can be used to predict academic and career success in data processing.

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Summary and Recommendations

The field of data processing is extremely fast growing with a tremendous need for trained professional data processors. There is a tremendous shortfall of trained qualified people with the shortfall projected to increase over the next decade. The Wall Street Journal, in its August 25, 1981 issue, quotes the U.S. Department of Labor in predicting the demand for computer programmers will double by the end of the decade. In order to help meet this demand, college and universities will need to greatly expand the number of data processing graduates.

In order for higher educational institutions to try and solve this problem in a period of limited available resources, it is necessary and desirable for them to reduce the attrition of students out of data processing programs and to identify and recruit those prospective students with the most aptitude and the most likelihood of graduating into a data processing program.

Because data processing is presently a glamorous, booming field attracting many individuals, it is critically important for colleges and universities to be able to inform students of their success potential. Otherwise, college data processing programs will continue to have a high failure and attrition rate. Very little research has been done with respect to predicting success in college data processing programs. Any tools that can make it easier to identify either the potential non-successful or successful data processing student will be a very valuable instructional and counseling asset.
Past predictive studies related to the field of data processing have concentrated on individual data processing courses or high school and community college programs rather than baccalaureate level programs. This research used traditional intellective variables such as high school class rank, standardized aptitude tests and grade point average for specific types of courses.

These predictive variables were found to be as reliable an intellective predictor of baccalaureate data processing program success as they were for the individual data processing courses or the high school and community college programs. The combination of predictors used in this study—high school class rank, and SCAT verbal and quantitative test scores—accounted for approximately the amount of variance in academic achievement in data processing as past predictive studies have found.

Differences by sex were found with respect to dropouts versus persistors of Ferris State Colleges' program in data processing. Differences by sex were not found for graduates of Ferris' B.S. data processing program in all college grade point average or for data processing career success.

This study determined that persistors in Ferris' B.S. program in data processing do differ from the dropouts with respect to intellective variables such as high school class rank, SCAT verbal and quantitative test score, and college English GPA.

Sufficient evidence was not found, as a result of this study, to enable the predictor variables used in this study to be reliably used in predicting career success in data processing. This and further
research is needed as very little previous studies have been done in attempting to identify variables that can be used to predict career success in data processing.

The findings of this study have added to the knowledge base concerning students in B.S. programs in data processing and the data processing field. This knowledge can provide the basis for further studies. Following are recommendations for further research based on the findings and conclusions of this study:

1. Additional research should be conducted before other colleges and universities use the findings of this study to establish selection policies for admission to B.S. programs in data processing in their institutions. In particular, the research should concentrate on identifying additional independent variables which could contribute to the prediction of academic success in data processing. These variables should be related to student motivation, personality, or other academic measures.

Although the findings do not warrant the establishment of selection policies for program admission, they can be used to set up guidance and counseling guidelines for counselors, guidance personnel, faculty, student advisors, and students.

2. Further replication studies at Ferris should be done in an attempt to determine the constancy of the results of this study. Due to the lack of available data, it was not possible to check the predicting capabilities of the prediction equations generated for Hypotheses 1 and 2 with an independent group of graduates. Further studies at Ferris can do this as more aptitude test data is available.
3. An additional predictive study that attempts to predict data processing career success should be done. The independent variables would be the same but different methods of arriving at a criterion variable would be utilized. The criterion might include salary information, position title, and look at the graduate after they have been in the career field for a longer period of years. In addition to surveying the supervisor, the graduates' peers and the graduates themselves could be surveyed.
APPENDIX A

CURRICULUM FOR B.S. DEGREE IN DATA PROCESSING
AT FERRIS STATE COLLEGE
<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
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</thead>
<tbody>
<tr>
<td><strong>First Quarter</strong></td>
<td><strong>Second Quarter</strong></td>
</tr>
<tr>
<td>ENG 101/111 - Eng. I</td>
<td>ECN 221 - Prin. of Econ. I</td>
</tr>
<tr>
<td>Laboratory Science</td>
<td>ACC 230 - Managerial Cost</td>
</tr>
<tr>
<td>ACC 121 - Prin. of Acc. I</td>
<td>Accounting</td>
</tr>
<tr>
<td>H-E 124 - Health Ed.</td>
<td>D-P 110 - Intro to D-P</td>
</tr>
<tr>
<td>P-E - Physical Ed.</td>
<td>MTH 116 - D-P Math</td>
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<tr>
<th><strong>Second Quarter</strong></th>
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<tbody>
<tr>
<td>ENG 102/112 - Eng. II</td>
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<tr>
<td><strong>Elective</strong></td>
</tr>
<tr>
<td>Lab Sci. or Math Elective</td>
</tr>
<tr>
<td>ACC 122 - Prin of Acc. II</td>
</tr>
<tr>
<td>Behavioral Science</td>
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<tr>
<td>P-E - Physical Ed.</td>
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<tr>
<th><strong>Third Quarter</strong></th>
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<tbody>
<tr>
<td>ENG 103/113 - Eng. III</td>
</tr>
<tr>
<td>+Behavioral Science</td>
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<tr>
<td>Speech</td>
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<tr>
<td>@Humanities</td>
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<tr>
<td>ACC 220 - Managerial Acc.</td>
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<td>P-E - Physical Ed.</td>
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**There are 28 hours of electives. Thirteen must be outside the School of Business.**

**Behavioral Science Includes:**
- Economics
- Psychology
- Geography
- Social Science
- Political
- Sociology
- Science

**Humanities Includes:**
- Art
- Literature
- Drama
- Music
- French
- Spanish
- History
- Speech 231

**Natural Sciences and Mathematics Includes:**
- Astronomy
- Geology
- Biological
- Mathematics
- Science
- Geography
- Biology
- Physical Science
- Chemistry
- Physics

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<table>
<thead>
<tr>
<th>Third Year</th>
<th>Fourth Year</th>
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<tr>
<td><strong>First Quarter</strong></td>
<td><strong>First Quarter</strong></td>
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<tr>
<td>MKT 321 - Prin. of Mkt.</td>
<td>D-P 450 - FORTRAN for Bus. Appl. OR</td>
</tr>
<tr>
<td>STT 321 - Business Statistics</td>
<td>D-P 460 - PL/1 Programming 4</td>
</tr>
<tr>
<td>D-P 320 - SOBOL</td>
<td>LAW 321 - Contracts &amp; Sales 4</td>
</tr>
<tr>
<td>D-P 330 - Systems Analysis</td>
<td>Gen. Studies Electives 3</td>
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<tr>
<td></td>
<td>PSY 221 - Intro to General Psychology</td>
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<td>@Humanities 3</td>
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<td>16</td>
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<tr>
<td><strong>Second Quarter</strong></td>
<td><strong>Second Quarter</strong></td>
</tr>
<tr>
<td>D-P 300 - Data Base Concepts &amp; Fac.</td>
<td><strong>Electives</strong></td>
</tr>
<tr>
<td>STT 335 - Quan. Method for Decision Making OR</td>
<td>(Recommended electives:</td>
</tr>
<tr>
<td>STT 323 - Statistical Inference</td>
<td>D-P 470 - Cooperative Edu. 12</td>
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<td>D-P 420 - COBOL Applications</td>
<td>D-P 471 - Cooperative Edu. Proj.)</td>
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<td>D-P 430 - Systems Desing</td>
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<td>@Humanities 3</td>
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<tr>
<td><strong>Third Quarter</strong></td>
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<tr>
<td>FIN 322 - Financial Mgt.</td>
<td>MGT 371/371</td>
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<tr>
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<td>D-P 480 - Advanced Systems 4</td>
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<tr>
<td><strong>Elective</strong></td>
<td>O-A 210 - Bus. Communications 4</td>
</tr>
<tr>
<td>D-P 220 - Prog. &amp; Sys. Tech. (RPG II)</td>
<td>@Humanities 3</td>
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<tr>
<td>D-P 440 - Systems Implementation</td>
<td>General Studies Elective 3</td>
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<td><strong>Suggested Electives:</strong></td>
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<tr>
<td>D-P 310 - Computer Programming II</td>
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<tr>
<td>D-P 450 - FORTRAN for Business Applications</td>
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<tr>
<td>D-P 460 - PL/1 Programming</td>
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<tr>
<td>D-P 470 - Cooperative Education</td>
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<tr>
<td>D-P 471 - Cooperative Education Project</td>
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<tr>
<td>STT 323 - Statistical Inference</td>
<td></td>
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<tr>
<td>STT 335 - Quantitative Methods for Decision Making</td>
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<tr>
<td>MGT 448 - Management Problems &amp; Policies</td>
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<tr>
<td>MGT 465 - Business &amp; Government</td>
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<tr>
<td>Q-A 252 - Principles of Office Administration</td>
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<tr>
<td>Any International Business Course</td>
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<tr>
<td>SPE 121 - Fundamentals of Speaking</td>
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<td>SPE 221 - Group Discussion</td>
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<tr>
<td>SPE 232 - Persuasive Speaking</td>
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<tr>
<td>PSY 224 - Applied Psychology</td>
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APPENDIX B

DESCRIPTIONS OF MAJOR DATA PROCESSING COURSES FOR FERRIS' DATA PROCESSING B.S. PROGRAM
D-P 110 - Introduction to Data Processing. Four quarter hours.

An introductory course designed to acquaint the student with the procedures and equipment used in modern data processing. Concepts required for later data processing courses are stressed. An introduction to program flowcharting and FORTRAN coding is included. Prereq: Open to data processing majors only.

D-P 130 - Computer File Organization. Four quarter hours.

A comprehensive study of disk, tape, data cell and drum file organization. The advantages and disadvantages of sequential, indexed-sequential and direct file organization and their implications in systems design. Prereq: D-P 110.

D-P 210 - Computer Programming I. Four quarter hours.

Fundamentals of assembler language, a low level machine oriented language, designed to give the student a comprehensive knowledge of the characteristics and architecture of the computer hardware. Includes basic logical, input/output and decimal arithmetic instructions. The course requires several hours of computer time per student. Prereq: D-P 110 and MTH 116.

D-P 220 - Programming and Systems Techniques Using RPG. Four quarter hours.

A thorough coverage of the Report Program Generator language operating under disk and tape operating systems. Covers the fundamentals of RPG programming and the RPG specifications sheets. Basic tools of the systems analyst are introduced such as, the systems flowchart, decision tables, PERT, etc. Course requires several hours of computer time per student. Prereq: D-P 110.

D-P 300 - Data Base Concepts and Facilities. Four quarter hours.

An introductory course in data base concepts, designed to acquaint the data processing student with the data base approach in modern systems. Logical and physical data structures required for a data base system are reviewed in detail. Programming, personnel, and system requirements are also discussed. Prereq: D-P 110, D-P 130, and D-P 210.

D-P 310 - Computer Programming II. Four quarter hours.

Advanced assembler language programming. Includes table search, looping, indexing, sub-routine linkage, macros and advanced programming techniques. The course requires several hours of computer time per student. Prereq: D-P 210.

D-P 320 - COBOL. Four quarter hours.

Introduction to a business oriented high level programming language. Teaches COBOL divisions and basic COBOL statements. Students will write and test basic programs. The course requires several hours of computer time per student. Prereq: D-P 130.

D-P 330 - Systems Analysis. Four quarter hours.

Presents the first sections of a structured method of analysis of systems design. This course covers the relationship of the systems...
analyst to management, analysis of current operation, definition of
goals and development of performance criteria for the new system.
Prereq: D-P 130 and D-P 350.

D-P 340 - Computer Operating Systems. Four quarter hours.
This course analyzes characteristics and advantages of computer
operating systems. It considers the functions of various manufacturer
supplied software with respect to management of system resources.
Sorts, utility programs and compilers are also discussed. Prereq:
D-P 130 and D-P 210.

D-P 350 - Principles of Teleprocessing. Four quarter hours.
A study of the equipment and techniques involved in the use of
teleprocessing as a tool in the data processing environment. Discus-
sion of applications suited to a teleprocessing approach will be
encouraged, and an elementary terminal coding will be introduced.
Appropriate terminology will be stressed. Prereq D-P 130 and D-P 210.

D-P 400 - Data Base Implementation. Four quarter hours.
A course designed to allow the students to get hands-on experience
in implementing an on-line data base management system. A indepth
examination is made of the data base management system currently
installed at Ferris State College. Prereq: D-P 210 and D-P 320.

D-P 420 - COBOL Applications. Four quarter hours.
Teaches advanced COBOL programming and concepts through solving
application problems. Includes PERFORM statement, tables, multiple
subscripting, variable length records and random processing. Course
requires several hours of computer time per student. Prereq: D-P 320.

D-P 430 - Systems Design. Four quarter hours.
This course presents the last part of a structured method of anal-
ysis of systems design. It is concerned with the generation of systems
alternatives and the selection of the optimum system for an organiza-
tion. Prereq: D-P 330.

D-P 440 - Systems Implementation. Four quarter hours.
This course is concerned with the techniques needed to successfully
implement a new computer system or application. Topics covered include
staffing, test sessions, PERT, scheduling and programming, systems and
machine room standards. Prereq: D-P 430.

D-P 450 - FORTRAN for Business Applications. Four quarter hours.
This course utilizes the FORTRAN programming languages in the
solution of business and scientific problems. Prereq: D-P 110.

D-P 460 - PL/1 Programming. Four quarter hours.
This course is concerned with fundamentals of PL/1 programming.
The PL/1 language will be utilized in the solution of business and
scientific problems. Prereq: D-P 320.
D-P 480 - Advanced Systems Design and Implementation. Four quarter hours. 
This is a team oriented course designed to integrate systems 
analysis and design with programming. Student teams will be involved 
in a computer application project from the systems analysis phase through 
systems design and programming to actual or simulated implementation. 
Prereq: D-P 420 and D-P 430.
APPENDIX C

ORIGINAL LIST OF ITEMS SUBMITTED TO DATA PROCESSING ADVISORY COMMITTEE TO BE CATEGORIZED INTO EITHER SYSTEMS ANALYSIS SKILLS, PROGRAMMING SKILLS, HUMAN RELATIONS SKILLS AND OTHER
1. Your characterization of the graduate's knowledge of basic data processing terminology would be:

2. Your evaluation of the graduate's knowledge of computer hardware components would be:

3. Your characterization of the graduate's skill in programming would be:

4. Your characterization of the graduate's skill in COBOL programming would be:

5. Your assessment of the graduate's program debugging skill would be:

6. Your evaluation of the graduate's knowledge of computer operating system concepts and functions would be:

7. Your evaluation of the graduate's understanding of parameter driven software packages, such as report generators, utilities, and sorts, would be:

8. Your assessment of the graduate's understanding of the demands of the data processing industry and how they are changing would be:

9. Your assessment of the graduate's ability to conduct a feasibility study would be:

10. Your characterization of the graduate's ability to perform systems analysis functions such as systems design, system documentation, and system implementation procedures would be:

11. Your assessment of the graduate's skill in working with user departments would be:

12. Your evaluation of the graduate's knowledge of file access methods and skill in designing files would be:

13. Your characterization of the graduate's knowledge of teleprocessing, distributed processing, and network concepts would be:

14. Your evaluation of the graduate's skill in project management would be:

15. Your characterization of the graduate's skill in verbal communication would be:

16. Your characterization of the graduate's writing skills would be:

17. In comparing the graduate's skills with graduates of other colleges and universities, your evaluation would be:
18. Your characterization of the graduate's data processing career potential would be:

19. Your assessment of the graduate's potential for entering data processing management would be:

20. If you were to go on the open job market to hire a person with the level of skills and knowledge such as you have just determined, what salary would you expect to pay?

21. Do you have any comments you wish to make that would improve the data processing program?
APPENDIX D

COVER LETTER SENT WITH MATERIALS IN APPENDIX E TO PILOT STUDY PARTICIPANTS
Enclosed are the materials that you will need to participate in the Ferris State College Data Processing Graduate Follow-up Pilot Study. The purpose of the Pilot Study is to determine if there are likely to be any problems with the actual study. Things we are concerned about are the questionnaire, the instruction sheet, and the cover letter. Please examine them for clarity. I am also interested in how long it took you to read the directions you see with any of the three documents.

After completing the questionnaire please do not mail anything to be until after I call you. I plan to discuss the study documents and procedure with you by phone and then have you mail them to me.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing
APPENDIX E

DATA PROCESSING GRADUATE SUPERVISOR SURVEY MATERIALS SENT TO PILOT STUDY PARTICIPANTS - COVER LETTER, INSTRUCTIONS FOR RESPONDENT, INSTRUMENT, AND SUPERVISOR'S PROFILE
As an educational institution, one of our greatest concerns is the quality of our graduates and the relevancy of their training to the needs of business and industry—as evaluated by their employers. For this reason the Data Processing Department, with the endorsement of the Vice President of Academic Affairs, is conducting a follow-up survey of the employers of our data processing graduates. As an employer of one (or more) Ferris data processing graduates your assistance is vitally needed and respectfully solicited to help make this research successful. It is for this reason that the enclosed questionnaire is being sent to you.

The graduate listed on the enclosed questionnaire form completed Ferris' baccalaureate program in data processing within the last four years. The graduates involved in the study provided their employer's name and address and the name of their supervisor as a result of being contacted by the Department of Data Processing.

You will recognize, as you review the attached questionnaire, that the entire research project depends upon the time necessary for you to complete the form. Please complete all the questions on this form even if the graduate no longer works for you or your organization. Also, if the graduate listed is your only employee, compare performance with others who have worked in the same position. For the best possible results, the employee's immediate supervisor should complete this questionnaire. The responses will in no way affect the employee and will be kept in strictest confidence.

With your help, future Ferris data processing graduates can be tailored to fit more closely the specific needs of you and your fellow businessmen. This is an opportunity for you to provide relevant input into data processing education.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing
Instructions for Respondent (This sheet is to be torn off before returning the questionnaire)

The graduate you are to answer the questions on is ______________________

1. Please use a pencil or pen to circle your response to each question. The zero response for "not applicable" means that you feel this aspect of data processing is not applicable to the graduate's particular position.

2. If you feel you cannot answer a question because you feel you lack the knowledge necessary to make a judgment about the graduate in regard to this area of data processing, please do not answer and leave blank.

3. This information is necessary for study credibility. The reader of the study needs to know in general what the supervisor's qualifications are for evaluating the graduates. The supervisor's information is to be used in summary form only with no individuals identified.

4. Tear off this instruction sheet before you complete the questionnaire.

5. You will notice the four character code on the upper left hand corner of the questionnaire. This code is used to match up the graduate's questionnaire with the remainder of the graduate's data at Ferris and still protect the privacy of the graduate. An identification key will be used until the study is complete, then the key will be destroyed. At no time will the graduate's name be printed on any of the data collection documents.

6. Fold the completed questionnaire and insert in the postage paid addressed envelope provided and mail.

7. Please do not write the name of the graduate on the questionnaire to preserve the confidentiality of this survey.
## ASSESSMENT OF THE GRADUATE'S DATA PROCESSING KNOWLEDGE AND SKILLS

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<thead>
<tr>
<th></th>
<th>WELL ABOVE</th>
<th>ABOVE AVG.</th>
<th>BELOW AVG.</th>
<th>WELL BELOW</th>
<th>NOT APPLIED</th>
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<tbody>
<tr>
<td>1. Your evaluation of the graduate's knowledge of functions of computer hardware components would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>2. Your characterization of the graduate's overall skill in programming would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. Your characterization of the graduate's specific skill in COBOL programming would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>4. Your assessment of the graduate's program debugging would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. Your evaluation of the graduate's knowledge of computer operating system concepts and functions would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>6. Your evaluation of the graduate's understanding of parameter driven software packages, such as report generators, utilities, and sorts, would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>1</td>
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<tr>
<td>7. Your assessment of the graduate's ability to conduct a feasibility study would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
8. Your characterization of the graduate's ability to perform systems analysis functions such as systems design, system implementation procedures would be: 5 4 3 2 1 0

9. Your assessment of the graduate's skill in working with user departments would be: 5 4 3 2 1 0

10. Your evaluation of the graduate's knowledge of file access methods would be: 5 4 3 2 1 0

11. Your evaluation of the graduate's skill in designing files would be: 5 4 3 2 1 0

12. Your characterization of the graduate's knowledge of teleprocessing concepts would be: 5 4 3 2 1 0

13. Your characterization of the graduate's knowledge of distributed processing concepts would be: 5 4 3 2 1 0

14. Your evaluation of the graduate's skill in project management would be: 5 4 3 2 1 0

15. Your characterization of the graduate's skill in verbal communication would be: 5 4 3 2 1 0

16. Your characterization of the graduate's writing skills would be: 5 4 3 2 1 0
17. Your characterization of the graduate's interpersonal skills, such as maintaining a good working relationship with peer group and other organizational members would be: 5 4 3 2 1 0

18. In comparing the graduate's skills with B.S. data processing graduates of other colleges and universities, your evaluation would be: 5 4 3 2 1 0

19. Your characterization of the graduate's data processing career potential would be: 5 4 3 2 1 0

20. Your assessment of the graduate's potential for entering data processing management would be: 5 4 3 2 1 0

21. Do you have any comments you wish to make that would improve the data processing program?
**SUPERVISOR'S PROFILE**

1. Supervisor's job title ________________________________

2. Circle highest level of education completed

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Masters</th>
<th>Doctorate</th>
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<td>1 2 3 4</td>
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<td>6</td>
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</table>

3. Age of supervisor ____________

4. How many years' experience in data processing? ________________

5. How many years' experience as a data processing supervisor? ___

6. How many personnel in the data processing shop or department? ___

7. How long have you supervised the graduate? ____________________

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APPENDIX F

FINAL VERSION OF THE DATA PROCESSING GRADUATE SUPERVISOR SURVEY
MATERIALS - COVER LETTER, INSTRUCTIONS FOR RESPONDENT,
INSTRUMENT, SUPERVISOR's PROFILE AND FOLLOW-UP LETTER
As an educational institution, one of our greatest concerns is the quality of our graduates and the relevancy of their training to the needs of business and industry—as evaluated by their employers. For this reason the Data Processing Department, with the endorsement of the Vice President of Academic Affairs, is conducting a follow-up survey of the employers of our data processing graduates. As an employer of one (or more) Ferris data processing graduates your assistance is vitally needed and respectfully solicited to help make this research successful. It is for this reason that the enclosed questionnaire is being sent to you.

The graduate listed on the enclosed questionnaire form completed Ferris' baccalaureate program in data processing within the last four years. The graduates involved in the study provided their employer's name and address and the name of their supervisor as a result of being contacted by the Department of Data Processing.

The success of this followup study depends upon your participation in completing the attached questionnaire. Please complete all the questions on this form even if the graduate no longer works for you or your organization. Make your comparative judgments to employees of comparable positions. For the best possible results, the employee's immediate supervisor should complete this questionnaire. The responses will in no way affect the employee and will be kept in strictest confidence.

With your help, future Ferris data processing graduates can be tailored to fit more closely the specific needs of you and your fellow businessmen. This is an opportunity for you to provide relevant input into data processing education.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing

Enclosure
Instructions for Respondent (This sheet is to be torn off before returning the questionnaire)

The graduate you are to answer the questions on is: ________________

1. Please use a pencil or pen to circle your response to each question. The zero response for 'not applicable' means that you feel this aspect of data processing is not applicable to the graduate's particular position.

2. If you feel you cannot answer a question because you feel you lack the knowledge necessary to make a judgment about the graduate in regard to this area of data processing, please do not answer and leave blank.

3. In responding to the questionnaire items that ask you to judge the graduate's knowledge or skill level, please consider his/her knowledge or skills at the present point in time.

4. You will notice the four character code on the upper left hand corner of the questionnaire. This code is used to match up the graduate's questionnaire with the remainder of the graduate's data at Ferris and still protect the privacy of the graduate. An identification key will be used until the study is complete and then the key will be destroyed. At no time will the graduate's name be printed on any of the data collection documents.

5. Fold the completed questionnaire and insert in the postage paid addressed envelope provided and mail.

6. Please do not write the name of the graduate on the questionnaire to preserve the confidentiality of this survey.

7. The Supervisor's Profile information is necessary for study credibility. The reader of the study needs to know in general what the supervisor's qualifications are for evaluating the graduates. The supervisor's information is to be used in summary form only with no individuals identified.

8. Tear off this instruction sheet before you complete the questionnaire.
## ASSESSMENT OF THE GRADUATE'S DATA PROCESSING KNOWLEDGE AND SKILLS

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<tbody>
<tr>
<td>1. Your evaluation of the graduate's knowledge of computer hardware component functions would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<tr>
<td>2. Your characterization of the graduate's overall skill in programming would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>1</td>
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<td>3. Your characterization of the graduate's specific skill in COBOL programming would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>4. Your assessment of the graduate's program debugging skill would be:</td>
<td>5</td>
<td>4</td>
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<td>2</td>
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<tr>
<td>5. Your evaluation of the graduate's knowledge of computer operating system concepts and functions would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>6. Your evaluation of the graduate's understanding of parameter driven software packages, such as report generators, utilities, and sorts, would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<td>7. Your assessment of the graduate's ability to conduct a feasibility study would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>8. Your characterization of the graduate's ability to perform systems analysis functions such as systems design, system implementation procedures would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>9. Your assessment of the graduate's skill in working with user departments would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<tr>
<td>10. Your evaluation of the graduate's knowledge of file access methods would be:</td>
<td>5</td>
<td>4</td>
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<tr>
<td>11. Your evaluation of the graduate's skill in designing files would be:</td>
<td>5</td>
<td>4</td>
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<td>2</td>
<td>1</td>
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<tr>
<td>12. Your characterization of the graduate's knowledge of teleprocessing concepts would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<tr>
<td>13. Your characterization of the graduate's knowledge of distributed processing concepts would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<tr>
<td>14. Your evaluation of the graduate's skill in project management would be:</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<tr>
<td>15. Your characterization of the graduate's skill in verbal communication would be:</td>
<td>5</td>
<td>4</td>
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<tr>
<td>16. Your characterization of the graduate's writing skills would be:</td>
<td>5</td>
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17. Your characterization of the graduate's interpersonal skills, such as maintaining a good working relationship with peer group and other organizational members would be: 

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18. In comparing the graduate's skills with B.S. data processing graduates of other colleges and universities, your evaluation would be: 

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<td>5</td>
<td>4</td>
<td>3</td>
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19. Your characterization of the graduate's data processing career potential would be: 

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<th>WELL BELOW</th>
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<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
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</table>

20. Your assessment of the graduate's potential for entering data processing management would be: 

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<th>WELL BELOW</th>
<th>NOT ABOVE CABLE</th>
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<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

21. Do you have any comments you wish to make that would improve the data processing program?
SUPERVISOR'S PROFILE

1. Supervisor's job title ______________________________________________

2. Circle highest level of education completed.

   Undergraduate   Masters   Doctorate
   1  2  3  4       5           6

3. Age of Supervisor ____________

4. How many years' experience in data processing? ________________

5. How many years' experience as a data processing supervisor? ___

6. How many personnel in the data processing shop or department? __

7. How long have you supervised the graduate? _________________

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We have not received your response to the graduate follow-up questionnaire sent to you recently. This letter is to remind you of the importance of this Ferris Data Processing Alumni followup study, both to you and other businessmen that employ Ferris Data Processing Graduates. The purpose of the study is to improve the quality of the Data Processing curriculum at Ferris State College.

Perhaps you can find the few minutes necessary to complete the enclosed questionnaire today while it is fresh in your mind. Your assistance is essential to the success of the study and your help is very much appreciated.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing

Enclosures
APPENDIX G

DATA PROCESSING GRADUATE EMPLOYER INFORMATION COLLECTION
MATERIALS SENT TO DATA PROCESSING GRADUATES - COVER
LETTER, DATA COLLECTION FORM, FOLLOW-UP LETTERS
January 30, 1980

The Data Processing Department is conducting a follow-up study of its graduates. The objective of this study is to gain information which will help us determine the effectiveness of our Data Processing program. We feel that the employers of our graduates are in the best position for providing meaningful input which will enable us to determine if our Data Processing program is meeting the needs of business and industry.

We are asking you to help by providing the needed information on the enclosed form. All information will remain strictly confidential. The information provided by your supervisor is to be grouped with information on the other graduates in the study. The results of the study will be reported as aggregate data and not about specific individuals.

Your help and cooperation is very much needed and appreciated. Thank you very much.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing

Enclosure
EMPLOYER'S NAME AND ADDRESS: ____________________________

________________________________________________________

________________________________________________________

SUPERVISOR'S NAME: ____________________________

SUPERVISOR'S TITLE: ____________________________

SUPERVISOR'S TELEPHONE NUMBER: Area (  ) __________________

________________________________________________________

(Your Signature)
February 20, 1980

We have not received your response to the employer questionnaire sent to you recently. This letter is to remind you of the importance of this Ferris Data Processing Alumni follow-up study, both to you and other businessmen that employ Ferris Data Processing graduates. The purpose of the study is to improve the quality of the Data Processing curriculum at Ferris State College.

Perhaps you can find the few minutes necessary to complete the enclosed survey card today while it is fresh in your mind. Your assistance is essential to the success of the study and your help is appreciated.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing

Enclosures
April 8, 1980

At the risk of antagonizing you, we are making a third request that you complete the enclosed questionnaire pertaining to your employer. The first two requests were sent to you several weeks ago.

If you failed to respond because you misplaced the first survey form, a new one is enclosed. It will only take a few minutes to complete. Please return it in the enclosed self-addressed envelope.

This research project is authorized by the Vice President of Academic Affairs at Ferris and the Dean of the School of Business. Its purpose is to help Ferris serve business and industry better through improving our Data Processing curriculum and to ensure that it is meeting the needs of business and industry. Your response and assistance in our study is very much needed and appreciated.

Sincerely,

Stuart J. Travis, Head
Department of Data Processing

Enclosures
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