Placement Center: A Study of Database Design for an Artisan Office

by

Cathy D. Puzzuoli

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Approved by:

Dr. Elizabeth A. Unger

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Chapter One

Introduction

1.1 Overview

An historic view of an office may be traced through three office models: the artisan office, the industrial office, and the information-age office.

The artisan office is a semi-structured office, with little systematic organization. The individuals in this type of office work independently of others, and typically carry a task to completion. The artisan office provides a wide variety of tasks, thus, must accommodate different styles of work. However, the use of technology is very limited in the artisan office.

The industrial office is a highly structured office. Tasks are generally fragmented, thus, an individual does not see a task through completion. The development of technology influenced the industrial office.

The information-age office is a semi-structured office model. This type of office exploits technology through the use of computer nodes and computer networks. Since the information-age office is responsive to new technology, more effective people are willing to work in this environment. An information-age office exploits new technology to preserve the values of an artisan office [HIR85].

Automation of an office is described by Nolan's stage theory [CHA80]. This theory may be divided into four stages: initiation, expansion, formalization, and maturity. The first stage, initiation, is based on the motivation to reduce costs in an office. This may be accomplished by mechanizing the manual tasks that are labor intensive, transaction based, or processes that are generally I/O bound. The second stage, expansion, is motivated by profit. The procedure for this stage is the development and use of tools for mechanizing

tasks that generate revenue. The third stage, formalization, is oriented toward better communication and faster response time. This is accomplished through the use of a real-time or interactive environment. The last stage, maturity, uses sophisticated systems to integrate the components of an office. Its main purpose is for production control.

The focus of this project is to design a database for a organization with an artisan type office, which is in the first stage of office automation. Further, the focus is to explore the use of the design methodology, which has been used successfully in projects for large organizations with industrial style offices, in a smaller organization. The design methodology to be used includes steps 1,2,4,5, and 7 of the method given in Figure 1.1.

The Career Planning and Placement Center (the Center) at Kansas State University is an example of an artisan office. One of the characteristics of an artisan office, the importance of human relations, symbolizes the Placement Center. The Placement Center is based on a group of individuals, each performing their jobs quite independently of the others. Different styles of work may exist.

1. Predesign Evaluation
2. Information Modeling
3. Semantic Modeling
4. Logical Database Design
5. Database Management Selection
6. Cost/Benefit Analysis
7. Physical Design and Implementation

Figure 1.1 Seven Design Steps

The main functions of the Center are to provide student services, employer services, alumni services, and office management [COL85]. The Center is a link between education and the world of work. Students use the Center for job search strategies, job campaigns, career selection, and pre-interview employer information. Students and alumni seeking

career alternatives could use this link to perspective employers. The Center may aid students by helping them prepare for both successful job performance and investigation of professional opportunities. Employers can utilize the Center to interview student candidates. The Center can provide prescreening of student candidates for employers and they can provide candidate information to perspective employers.

The Center decided to modify their artisan-type office and begin the conversion to an information-age office. Some of the reasons to computerize the office [HIR85][COL85] are given in Figure 1.2. The Center desired to computerize the tasks given in Figure 1.3.

1. budget cutbacks and reduction of staff
2. continual need of students and employers to use the placement center
3. linkage between education and the world of work needs to be facilitated
4. more staff time available for professional tasks
5. the elimination of paper shuffling
6. the elimination of redundant work and unnecessary tasks such as retyping, manual filing, and retrieval
7. better utilization of human resources for tasks that require judgement, initiative and rapid communication — better response time
8. faster and better decision making that takes into account multiple complex factors
9. reduction of schedule errors and omissions
10. the quickness that information can be obtained
11. to provide accurate information

Figure 1.2 Reasons to Computerize the Office

1.2 Related Computerized Systems

The literature provided information on several software packages designed for use in a Placement Center. There were five systems discovered which provided information, positive or negative, to guide the project. It was hoped initially that one of these packages could be used directly or adapted for use. That option proved not to be viable. Each of the five systems is described and critiqued.

The ISU resume system was developed by Iowa State University in 1985. This software package requires dBaseIII and an IBM compatible computer with hard disk. The ISU resume system was limited in its capabilities; its main function was to be used as a student resume service for employers. Also, the software for this system was still being debugged.

1. storage and retrieval of student information
2. storage and retrieval of company information
3. storage and retrieval of employment information
4. calculation of recruiter statistics
5. calculation of registered student statistics
6. calculation of company statistics
7. calculation of placement by curriculum statistics
8. calculation of geographical placement statistics
9. listings for: perspective employers, a master visit list, a posting schedule, students by curriculum, students by GPA, students by date available for employment, students by location for employment

Figure 1.3 The Placement Center Tasks to Computerize

The VitaQuik CIS (Candidate Information System) [CPC84] is a system developed by MidWest College Placement Association in 1985. This system also requires dBaseIII and an IBM compatible computer with a hard disk. The CIS system is limited to a student resume service that has as its functions entering, updating, sorting, selecting, transmitting, and printing job candidate information. Like the ISU resume system, it does not perform any tasks for employer information, company information, or perform any statistics. The system was too limited in its capabilities.

The CSU-ISS (Colorado State University - Interview Scheduling System) [COL84] was developed by Colorado State University in 1984. It was developed using R:base 5000 and requires an IBM compatible computer with hard disk. The CSU-ISS may provide a student

resume system, an interview system, closed interview schedules and prescreening of requests, performs statistics based on student and company information, and generate reports. Many menus are needed to provide all these tasks and many input forms are required to attain all the information needed to perform these tasks. The cost of this package was $900 for CSU-ISS software, and an additional $700 for a copy of R:base 5000 software. Thus, it cost $1600 per computer. Each package is sold on a copy basis and the Center needed three workstations.

Another software package, produced by the Career Information Center at Michigan State University [MIC84], is known as SIGI (System of Interactive Guidance and Information). It is used by students in job preparation. SIGI may be resident in a personal computer. The Michigan State system utilizes mainframe capabilities to provide statistics and reports based on student and company information. This package was not chosen because it offered more than the Center needed and the Center does not have mainframe capabilities at the present time.

The U-Place (University Placement System) software package was developed by Spartin Systems in 1985. The software can be used to store student and company information, generate reports, and information can be downloaded from the mainframe [BRU86]. U-Place is still under development. Problems occurred when loading a demonstration version. No statistics are generated. The system was not chosen because it did not perform all the tasks required by the Center, and because of the problem that occurred when loading the system.

Thus, no pre-packaged software systems met the needs of the Center. The Center opted to develop a personalized placement center software package using a database management system (DBMS).

1.2.1 Selection of a DBMS

A DBMS is defined as a collection of programs, firmware, and occasionally hardware, which gives the user access to information stored in a database [KRU83] [TOW85]. The DBMS is used to reduce possible duplication of data. The DBMS is also used to keep track of how and where data is stored. It can provide some data integrity by strong typechecking.

System considerations when choosing a DBMS for this project are: adequate storage for programs and database files; access time of data; and whether the DBMS is a fully compatible IBM package.

The first DBMS package the Center considered was R:base 5000 [MIC85] [POO85], a relational database management system. It was considered because it allows the user to create individualized application programs; has provided good programming features such as its own compiler and application generator; may provide password security and user defined data rules; and a user may import data directly from popular personal computer software packages such as Lotus 1-2-3. It is possible to have up to 400 database fields in R:base 5000. The maximum record size is 1530 characters. The sort time for this system is quite fast. Also, R:base 5000 can be installed on an IBM compatible computer with a hard disk. The cost of the R:base 5000 package is $700 for one, with a discount of 75% for purchases of 5 or more. Knowledge of its procedural language is also required for its use.

dBaseIII [ASH84] [BEI85], a relational database management system, was considered because it allows the user to create individualized application programs, provides good application development features such as a procedural language and multiple table data input, provides the user convenient features such as on-line help, command prompting, and macros. The number of database fields allowed are 128. dBaseIII can be installed on an IBM compatible computer with a hard disk. The cost of the dBaseIII package was $375 for one.

dBaseIII was chosen for this project. It was chosen because it has good application development features; it has "user-friendly" input templates; it has top down design style programming; it has ample storage capabilities in a database file; it has independence of data and programs for programming and maintenance purposes; the dBaseIII software was fully IBM compatible; and the Center already owned the dBaseIII software.

1.3 Project Overview

This project is the initial phase in the conversion of an artisan office into an information age office. The main aims of the project are given in Figure 1.4.

The rest of this report is organized into four chapters. Chapter Two discusses the description of the problem environment. The functional needs of a major university placement center are determined. Each of the forms used to determine the functional needs are defined. Redundancy of data among the forms is analyzed. Data analysis is performed to determine the needed data items from each form.

Chapter Three addresses the design of the database for this project. The tool used to evaluate the relationships among the data was the Entity-Relationship Model (E-R Model). Functional dependencies are determined. Bernstein's Second Algorithm, a tool used to determine if a relation scheme is in third normal form, is performed using the functional dependencies as input. The relational database that resulted from the Bernstein's Second Algorithm is given.

Chapter Four discusses implementation issues. Description of a database management system (DBMS) is given. Justification for choosing dBaseIII as the DBMS is made. The database structures, based on the design steps of Chapter 3, are presented.

Chapter Five contains the results of this project and suggests possible future directions.

1. Predesign Evaluation: to analyze the functional needs of a major university placement center
- to determine the purpose of the forms used in this project
2. Information Modeling: to analyze the data requirements of such an organization
- locate redundant data among the forms
- identify data items that are needed for this project
- identify data items needed for future implementations
3. Logical Database Design: to create an enterprise view of the organization based upon a third normal form analysis of the data dependencies
- create entity-relationship models for each entity used in this project
- determine the functional dependencies among the attributes
- perform Bernstein's Second Algorithm using the functional dependencies as input to produce a relation scheme in third normal form
4. Database Management Selection: - selection of dBaseIII
5. Physical Design and Implementation: to create database files using dBaseIII to collect data for each entity based on the third normal form analysis of the data dependencies of the organization
- to implement the database files
- to create application programs using dBaseIII
- to calculate recruiter statistics, registered student statistics, calculate companies recruiting by GPA, curriculum, or both GPA and curriculum, calculate placement by curriculum, and calculate geographical placement statistics

Figure 1.4 Aims of the project

Chapter 2

Description of Problem Environment

The problem environment for this project is the Career Planning and Placement Center at Kansas State University. The Career Planning and Placement Center has among its functions: to aid students in career planning, and to enlist companies to interview KSU's students for job placement.

The staff of the Center who will have access to the database are the director, the administrative assistant, the schedule secretary, each of their secretaries, the associate director in charge of Agriculture and Education colleges, and the secretary of the Assistant Dean of the Arts and Sciences college.

The Center is in the first stage of office automation [CHA80] with word processing as the primary use of computers. Typically, the Center relies on paper forms. Forms are needed to relate interview information, job announcement, student data, company information, and schedule information. These forms are included in Section 2.1. A brief description of each form is also given in Section 2.1. Because of the large number of forms used, some redundancy of data occurs. Section 2.2 discusses redundancy, and where redundancy occurs in the forms. Data analysis is used to eliminate redundancy and define data items used. This process is described in Section 2.3.

2.1 Forms

There are six functional areas where forms are utilized at the Center: student information, company information, announcement of interview schedules, job announcement, pre-selection on-campus interview information, and company cancellation information. Each of the forms used in these areas are briefly discussed in the following paragraphs.

2.1.1 Student Information Forms

There are two forms used by the Center to collect student information. They are the Student Data Sheet and the Employment Report. It is the responsibility of the student to complete and return both of these forms. A student may have only one Student Data Sheet and one Employment Report in the database.

The Student Data Sheet [Figure 2.1] is supplied by the student as part of the registration process at the Center. Completion of the form allows the student to participate the career planning and placement activities at the Center. The Student Data Sheet is also provided by the student to those companies which the student desires to interview. This form provides basic information, such as student name, address, some personal data, job interests, educational data, achievements, skills, occupational experience, and references.

The Employment Report [Figure 2.2] is supplied by the registered student at the end of the semester, or upon job placement. This form provides information to the Center regarding the student's job placement. This information includes company name, location, and salary. Other interview information is provided, such as the number of companies the student interviewed, information regarding the Center's role in aiding the student in career planning and placement; and finally, asks the student to describe other services used in the search of a job.

2.1.2 Company Information Forms

The Center gains company information from the following forms: the Employment Report (see Student Information Forms), the Employment Opportunity Report (see Job Announcement Form), the Interview Arrangements Questionnaire, and the Date Establishment Sheet.

The Interview Arrangements Questionnaire (IAQ) [Figure 2.3] is used to initiate the interview process with the Center. This form provides the company name, address, potential

interview times, coordinator name and address, recruiting information, and job information.

The Date Establishment Sheet (DES) [Figure 2.4] is sent to the Center by a company to announce its interview schedule. This form usually follows, in time, the IAQ form. Basic information, such as organization name and address, establisher, and the number and date of interviews, is found on the DES. 2.2 Redundancy of Data Among the Forms

Redundancy of data is the replication of data on a number of different files [KRU83]. Redundancy of data may cause data integrity problems during the update process of a database. The goal of database design is to achieve no redundancy of data; a goal almost never achieved.

Sources for redundancy of data, and therefore data integrity problems, in the database occur in the student information forms (Student Data Sheet and the Employment Report). Curriculum, degree, and graduation date are replicated. This may or may not be a major problem, since many students turn in the Student Data Sheet, but not many students turn in the Employment Report. Therefore, the probability of integrity problems occurring is small.

In the company information forms (IAQ and DES), redundancy of data occurs in these data items: establisher's name or contact name, establisher's phone number or contact phone number, and title. However, on occasion, the establisher/contact information may be different. A careful check must be made to ensure the correct establisher/contact data is being stored. The issue of redundant data in the database designed for this project will be dealt with in Chapter Five.

DATA SHEET

Please Type

KANSAS STATE UNIVERSITY
Career Planning and Placement Center
Manhattan, Kansas 66506

It is our policy to deal only with equal opportunity employers and those complying with PL 93-380 re confidentiality of records

Name _____ Date _____
(Last) (First) (Middle)

Other name(s) used now or previously _____

Present Address _____ Phone (AC) _____ _____

Permanent Address _____ Phone (AC) _____ _____

PERSONAL DATA: (optional)

Birthdate _____ Height _____ Weight _____ Sex _____ Citizenship _____ (Country)

Relevant health considerations _____ Type of Visa _____

JOB INTERESTS: _____

Available for employment? _____ (Date) Location Preferences: _____

EDUCATIONAL DATA:

Colleges Attended and Location	Dates of Attendance	Degree	Major Field*	G.P.A. in Major	Overall G.P.A	Graduation Date

Grade point system at Kansas State: A = 4, B = 3, C = 2

*Other areas of concentration and hours _____

Percent of college expenses: Working ____ Scholarships ____ Grants ____ Other _____ (Specify)

Honors, Scholarships, Professional, and Honor Societies _____

Community/Extra-curricular activities _____

Special skills, interests, and hobbies _____

OCCUPATIONAL EXPERIENCE: (Include full and pertinent part-time work)

Employer	Address	Duties	Dates Employed

☐ "X" in block indicates continuation under related headings on reverse or attachment.

REFERENCES. (Names, titles, addresses, phone numbers of faculty members, former employers, etc.)

1. _____
2. _____
3. _____

ADDITIONAL INFORMATION _____

I affirm that the above information is correct to the best of my knowledge and, subject to the provisions of PL 93-380, hereby authorize the Career Planning and Placement Center to release this data sheet and related information, including references, to prospective employers and/or to institutions of higher learning. I have read and understand the statement of Principles and Practices of College Placement promulgated by the College Placement Council, Inc. and promise to comply therewith.

_____ _____
Legal Signature Social Security No. (typed)

Figure 2.1 Student Data Sheet

KANSAS STATE UNIVERSITY

Career Planning and Placement Center

Holtz Hall
Manhattan, Kansas 66506
913 532-6506

I authorize ☐ do not authorize ☐ use of this information (excluding salary information) to be used for publicity purposes.

EMPLOYMENT REPORT
(Commercial and Service Section)

In an effort to obtain needed data, we ask that you complete this form during your job search and return it at the end of the school year or when you accept a position—whether or not you are registered at the Career Planning and Placement Center or have interviewed on campus, and whether or not you have previously reported some of the information. You may wish to make a photocopy for your records. The information you provide is treated professionally and salary information is kept confidential.

Print Name _____ Date of Degree _____

Curriculum or Major _____ College _____

Degree: ___BS ___BA ___MS ___MA ___DVM ___PhD _____ (other)

Employer _____ Your job title _____

Employer address _____ Starting date _____

_____ Starting salary (monthly gross)* $ _____

Not employed, but: ___Seeking employment ___Graduate school at _____

___Other _____

Are you registered at the Career Planning and Placement Center? _____

Do you wish to receive registration materials? _____

With Career Planning and Placement assistance or as a source of job openings (estimate if necessary):**
How many job interviews have you had? _____
How many "non-interview" write-in applications have you made? _____

Without Career Planning and Placement Center assistance (on your own):**
How many job interviews have you had? _____
How many "non-interview" write-in applications have you made? _____

Career Objective. _____

_____

_____

Please comment favorably or unfavorably as justified with reference to:

Treatment by employer representatives: _____

_____

_____

Assistance from faculty and departmental advisors: _____

_____

_____

Career Planning and Placement Center services to you: _____

_____

_____

(over)

* Include amounts estimated for services such as lodging and food related to Ag positions, etc.
** Please complete the chart on the back of this page.

Figure 2.2 Employment Report

KANSAS STATE UNIVERSITY

AC 913 532-6506 — **Career Planning and Placement Center** — Holtz Hall, Manhattan, KS 66506

INTERVIEW ARRANGEMENTS QUESTIONNAIRE (IAQ)

(Please Type)

Interview days and dates for which this IAQ is applicable: _____

CAUTION: Cover more than one date or sequence only if your requirements will be absolutely constant (additional IAQ blanks available upon request for different schedules)

Name of Organization: _____

Complete Address: _____

No. of daily interview schedules: _____ Name of coordinator: _____

No. of interviewers if more: _____ Title: _____

Daily interview start time: _____ Phone AC _____

Interviews to conclude by: _____ Length of each interview _____ minutes

Name(s) of interviewer(s): _____

Inviting graduates of December (19__) ____ May (19__) ____ August (19__) ____ December (19__) ____

Wish to interview for summer employment (classification indicates year completed):

Freshman ____ Sophomore ____ Junior ____ Senior ____ Graduate Students ____ Not at all ____

NOTE Explain on an attached sheet or by transmittal letter your request for separate summer schedule, mixed regular schedule, or summer group meetings, etc.

International candidates interviewed: ____ without restriction ____ holding permanent resident status

____ U.S. citizens only ____ cannot be interviewed on campus

Comments:

Type of industry: _____

Location(s) of work: _____

For curricula and degree combinations invited, see ☐ reverse ☐ attached

List types of positions available, special qualifications required, and indicate if openings are deferred or speculative:

Literature for student distribution: ☐ is being sent ☐ is not available

It is the policy of the Career Planning and Placement Center of Kansas State University to serve only equal opportunity employers. We also are required by Public Law 93-380 to remind employers that the Family Educational Rights and Privacy Act compels the handling of employment records on a confidential basis. By completing and returning this IAQ form the employer publicly affirms full compliance with the law.

_____

This IAQ has been prepared on (date) _____ by _____

Correspondence concerning this visit should be directed to: _____

_____

This will be used to publicize your visit and will be attached to your sign-up sheet. _____

BLUE COPY—Send to K-State
YELLOW COPY—Employer to retain

IAQ Page 1

Figure 2.3 Interview Arrangements Questionnaire

VISIT DATE ESTABLISHMENT SHEET

Orgsnization _____ Dete Received _____

_____ Teken hy (show initials):

Address _____ Phone ____ Visit ____ IAQ ___

_____ Letter of _____ Other _____

Estahlisher's Name _____ Tel. (___) _____

Title _____

Confirm to (if other than estehlisher) _____
Name Title

Address (If Different) _____

_____

scheds. _____ # intvrs. _____ M TU W TH F_____ 86 87 88 89
Month-1st Day

scheds. _____ # intvrs. _____ M TU W TH F_____ 86 87 88 89
Month-2nd Day

scheds. _____ # intvrs. _____ M TU W TH F_____ 86 87 88 89

_____

ACTION REQUIRED	DATE DONE	INITIAL
1. Check Visit Date Card to prevent duplication	_____	_____
2. Record on Visit Date Cerd	_____	_____
3. Record in Visit Date Book (hoth index and date)	_____	_____
4. Mail confirming letter standard ___special___	_____	_____
Their standard form also used ____		
Other dates confirmed on same letter _____		
5. PVM's mailed___with C/L___Later___	_____	_____
Mail follow-up sent _____(date & initial)		
Telephone follow-up_____(date & initial)		
6. If Visit List has heen published enter on Master Viait List	_____	_____
7. Check Mailing Card existence end/or accuracy	_____	_____

SHOW # INTERVIEWERS ONLY IF DIFFERENT THAN # OF SCHEDULES THAT DAY
CHECK MARK SUFFICES FOR "DATE DONE" IF SAME DAY AS RECEIVED.
_____ Additional information on reverse (head to tail) or attached.

Figure 2.4 Date Establishment Sheet

2.1.3 Announcement of Interview Schedules

Two forms are generated to announce upcoming company interview schedules, the Master Visit List, and the Posting Schedule.

The Master Visit List [Figure 2.5] is produced once a semester. It can be divided into four parts: general interview information, interview sign-up dates, curriculum abbreviation index, and a listing of scheduled interviews for the semester. The fourth part, the listing of scheduled interviews for the semester, can be subdivided into interview visit date, acceptable graduation dates, the semester(s) that the company will visit Kansas State University to interview for job placement, company name, location of company (optional), location of job openings, degree required, curriculum, and major.

The Posting Schedule [Figure 2.6] lists current information regarding interviewing companies. This form lists additions, modifications, and deletions to the Master Visit List. The Posting Schedule is similar to the listing of scheduled interviews section of the Master Visit List.

2.1.4 Job Announcement

The Employment Opportunity Report (EOR) [Figure 2.7] is used by a company to report job openings. The form gives basic information, such as company name, application deadline, job information, who to contact regarding the job opportunity, and whether the company wishes to interview on-campus. to the Master Visit List. The Posting Schedule is similar to the listing of scheduled interviews section of the Master Visit List.

2.1.5 Pre-Selection On-Campus Interview Information

Three weeks prior to a scheduled interview, the student must register on the Interview Request Form (IRF) [Figure 2.8], to indicate an interest in interviewing the company. This form contains the organization name, date(s) of interview, major and degrees requested, and graduation dates that will be accepted. Upon registering, the student leaves a Student

Data Sheet that will be forwarded to the organization.

2.1.6 Company Cancellation Information

The Visit or Schedule Cancellation Sheet [Figure 2.9] is used by a company to cancel some or all of its arranged interview times with the Career Planning and Placement Center. Basic information, such as organization name, address, cancellation information, and action required by the Placement Center, is given on this form.

2.2 Redundancy of Data Among the Forms

Redundancy of data is the replication of data on a number of different files [KRU83]. Redundancy of data may cause data integrity problems during the update process of a database. The goal of database design is to achieve no redundancy of data; a goal almost never achieved.

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SCHEDULED EMPLOYMENT INTERVIEWS - SPRINC SEMESTER 1987

INTERVIEW VISIT DATE ACCEPTABLE GRAD. DATES SEMESTER(S) VISITINC KSU	COMPANY NAME (LOCATION OF COMPANY) LOCATION OF JO8 OPENINCS	DEGREE REQUIRED LEVEL & CURRICULUM OR MAJOR
February 2 5/87 Spring Only	Cigna Corporation (Philadelphia, PA) Nationwide	B: ECON, ACCTG, FINAN, GBA, MKTG GPA 3.0
February 2 12/86, 5-8/87 Summer: FR, SOPH, JR Spring & Fall	US Army (Manhattan, KS) Worldwide	B: ANY & ALL MAJORS
February 2 5/87, 8/87 First Visit	Waatvaco (Covington, VA) Covington, VA; Laurel, MD; Charleston, SC	M OR D: ME, CHE
February 3 12/86, 5-8/87 Spring Only	ADM Milling Company (Shawnee Mission, KS) Varioua	B: MSM
February 3 Summer: All Classes Spring Only	Cheley Colorado Camps (Denver, CO) Estes Park, CO	Summer: ANY & ALL MAJORS - OPEN SICNUP
February 3 12/86, 5/87 Spring Only	Civilian Personnel Office (Ft. Riley, KS) Ft. Riley, KS	B: INSYS, JMC, ALL BUS EXCEPT ACCTG B OR M: CMPSC, ECON, ENCL, POLSC, PSYCH HIST
February 3 5/87, 8/87 Spring & Fall	FDIC (Overland Park, KS) KS, MO, IA, NE, MN, ND, SD	B: FINAN, G8A 8 OR M: ACEC, ACCTG (Minimum of 6 hra ACCTG)
February 3 5/87 Spring Only	Parker Hannifin (Cleveland, OH) Nationwide	B: EE, ME
February 3 Summer: JR, SR Spring & Fall	The Procter & Camble Co. (Cincinnati, OH) Kanaas City Coffee Plant	B OR M: CHE, EE, ME
February 3 5/87, 8/87 Spring & Fall	Red Lobster Inns of America (Rolling Meadowa, IL) Midweat	8: MANGT

Figure 2.5 Master Visit List

CAREER PLANNING ANO PLACEMENT CENTER
INTERVIEW REQUEST FORMS POSTED ON MONOAY, MARCH 23, 1987
FOR MONOAY, APRIL 13, 1987
POSTEO AT 8 A.M.

EMPLOYERS REINSURANCE CORPORATION
1 SCHEDULE
12/86, 5/87

B: ANY & ALL MAJORS
6 HOURS COBOL
GPA 3.0

OPEN SIGNUP FOR MONOAY AND TUESOAY, MARCH 30-31, 1987

PROOUCTION ADVISORY SERVICE, INC.
1 SCHEDULE EACH DAY
SUMMER - ALL CLASSES

ALL ARICULTURE

Figure 2.6 Posting Schedule

Employers
Pleese Report Job Openings

Career Planning and Placement Center
KANSAS STATE UNIVERSITY
Holtz Hell, Phone 913-S32-6506

EMPLOYMENT OPPORTUNITY REPORT

For office use only		Done
Reported by:	PC EO List/Library	
(Initial)	Orig to BL JA KL	
Mail	Search & SL PL	
Phone	Notify candidates	
Faculty	PC to	
Pers visit		
Other		

Dete _____

Applicetion Deadline _____

Preferred Starting Date _____

PLEASE NOTE It is the policy of the Career Planning and Plecement Center of Kenses Stete University to deel only with equel opportunity employers.

Job Title _____

Degree end Curriculum _____

Speciel Requirements _____

Job Description _____

_____

_____

_____

Work Locetion _____

Travel Requirements _____

Experience Required _____

Salery end Fringe Benefits _____

Contect Neme _____ Title _____

Orgenization _____

Address _____

_____ Phone (_____) _____

FURTHER REPRODUCTION AND DEPARTMENTAL DISTRIBUTION IS REQUESTED AS APPROPRIATE

Copies of Employment Opportunity Reports are posted deily in the Career Plenning end Plecement Center Librery in Holtz Hell. Cendidetes should contect persons listed there rether then steff members. All Commercial end Service Employment Opportunity Reports ere ebstrected semi-monthly in buff (off-white) newsletter form JOBS bulletins, with departmental circuletion.

Figure 2.7 Employment Opportunity Report

CAREER PLANNING AND PLACEMENT CENTER

Commercial & Service Placement

KANSAS STATE UNIVERSITY
Manhattan, KS 66506

Page No. _____

INTERVIEW REQUEST FORM

INTERESTED CANDIDATES MUST LEAVE DATA SNEET FOR FORWARDING TO THE ORGANIZATION

ORGANIZATION _____

DATE OF INTERVIEW _____

MAJOR(S) & DEGREE(S) REQUESTED (Persons with closely RELATED degree, coursework, or work experience may alao request an interview) _____

GRADUATION DATE(S) _____

NAME	PNONE	NAME	PNONE
1.		19.	
2.		20.	
3.		21.	
4.		22.	
5.		23.	
6.		24.	
7.		25.	
8.		26.	
9.		27.	
10.		28.	
11.		29.	
12.		30.	
13.		31.	
14.		32.	
15.		33.	
16.		34.	
17.		35.	
18.		36.	

Figure 2.8 Interview Request Form

VISIT OR SCHEDULE CANCELLATION SHEET

Orgenization _____ Dete Canc. Rec'd. _____

_____ Phone Cell Taken By _____

Address _____ Letter Dated____Rec'd By___

_____ Other _____

Cencellor'e Name _____ Tel. (____) _____ _____
AC

Title _____

_____ Complete cencelletion of visit, no trenefer or replecement dates.

_____ Complete cencelletion of vieit, hut involving replecement dete(e) _____

No. Schedules _____ _____ _____ M TU W TH F 86 87 88 89 90
Month 1st Day

No. Schedulee _____ _____ _____ M TU W TH F 86 87 88 89 90
Month 2nd Dey

_____ Pertiel Cancelletion

_____ _____ M TU W TH F 86 87 88 89 90
Month 1et Dey

_____ _____ M TU W TH F 86 87 88 89 90
Month 2nd Day

_____ Schedules reduced in number from _____ to _____

_____ Schedulee reduced in length ee deecribed:

_____

_____ Other (Explein) _____

Remarke _____

* *

Reaeon for cencelletion: _____ Light Schedule _____; _____ Reduced Manpower
No.
Need; _____ Recruiter Convenience; Other _____

SEE REVERSE SIDE FOR ACTION REQUIRED

One of these sheete is to he prepered for eech company cencellation. Cancellation sheete ere to he etteched to the Vieit Dete Eetehliehment sheete which they cencel; on top for complete cancelletion, end undsrneath for partial cencelletions.

Figure 2.9 Visit or Schedule Cancellation Sheet

2.3 Data Analysis

After determining the redundancy of data, careful data analysis was made. The data items that are needed are identified, defined and classified using a tool known as a data dictionary. Data items not needed at the present time for the database are identified. Finally, data items needed for future implementation are noted.

2.3.1 Identification of Needed Data Items

A data dictionary [LAR82] is used to identify, define and classify the data needed from each of the input forms. Each of the data items entered in the data dictionary is named, defined, given a type, formatted, and bounded. Also, information about security, frequency, availability, and user responsibility is given.

Only the data items in the permanent database structures are entered in the data dictionary [see Appendix A for complete Data Dictionary]. The format of the Data Dictionary is given in Figure 2.10.

NAME	:	CONAME
DEFINITION	:	company name, found on the IAQ form
TYPE	:	A
FORMAT	:	A*20
RANGE OF VALUES	:	"A" - "z", 0 - 9
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may not be altered in change company
FREQUENCY	:	at any time
AVAILABILITY	:	Fast storage device
FD ON	:	none, partial key to company database

Figure 2.10. Example of an entry in the Data Dictionary.

2.3.2 Data Items Not Used

After determining the data needed for the database structures, it is necessary to examine the unused data items stored in the database.

2.3.2.1 Student Data Sheet [See Student Data Sheet, Figure 2.1]

The data items that appeared on the Student Data Sheet which are not stored are given in Figure 2.11. These items are not needed in the calculations that are to be performed on the database, are not needed in any outputting that is to occur, and are not needed as input to the student information database. Therefore, they are redundant or extraneous data.

other names used previously
personal data
job interests
educational data
other areas of concentration
percent of college expenses
honors
scholarships
societies
activities
skills
occupational experience
references
additional information

Figure 2.11 Data Items Not Used on the Student Data Sheet

2.3.2.2 Employment Report [See Employment Report, Figure 2.2]

The data items smidinit, mdegdate, ydegdate, received are stored but not used. The data elements on the Employment Report which are not stored are given in Figure 2.12. These items are not needed in the calculations that are to be performed on the database, are not needed in any outputting that is to occur, and are not needed as input to the student employment information database. Therefore, they are redundant or extraneous data.

job title
starting date
registered at Career Planning and Placement Center
wish to receive registration materials
information on assistance provided by Center/others
information on interviews the student participated in
authorization to use the employment report information

Figure 2.12 Data Items Not Used on the Employment Report Form

2.3.2.3 Interview Arrangements Questionnaire [See Interview Arrangements Questionnaire, Figure 2.3]

The data items found on the IAQ that are not stored are given in Figure 2.13. These items are not needed in the calculations that are to be performed on the database, are not needed in any outputting that is to occur, and are not needed as input to the company information database. Therefore, they are redundant or extraneous data.

applicable interview dates
number of daily interview schedules
number of interviews if more
daily interview start time
interviews to conclude by
length of each interview
name(s) of interviewer(s)
types of positions available
special qualifications
openings deferred or speculative
date IAQ prepared and by whom
correspondence name and address

Figure 2.13 Data Items Not Used on the Interview Arrangements Questionnaire

2.3.2.4 Date Establishment Sheet [See Date Establishment Sheet, Figure 2.4]

The following data items are stored but not used: des_date and des_inits. The data elements on the DES that are not stored are found in Figure 2.14. These items are not

needed in the calculations that are to be performed on the database, are not needed in any outputting that is to occur, and are not needed as input to the company information database. Therefore, they are redundant or extraneous data.

address
how DES is received
action required
additional information

Figure 2.14 Data Items Not Used on the Date Establishment Sheet

2.3.2.5 Visit or Schedule Cancellation Form [See Visit or Schedule Cancellation Form, Figure 2.10]

The data items that are not stored are found in Figure 2.15. These items are not needed as input to the company information database, are not needed in output, and are not needed in any calculations that are to be performed on the database. Therefore, they are redundant or extraneous data.

date cancellation received
phone call taken by
letter dated
received by
other
cancellor's name
cancellor's title
cancellor's phone
remarks
reason for cancellation
action required

Figure 2.15 Data Items Not Used on the Visit or Schedule Cancellation Form

2.3.2.6 Employment Opportunity Report [See Employment Opportunity Report, Figure 2.7]

The data items not stored from the EOR are given in Figure 2.16. These items are not used in any input, output, or calculations that are based on the employment opportunity database.

preferred starting date
travel requirements
experience required
fringe benefits
title

Figure 2.16 Data Items Not Used on the Employment Opportunity Report

2.3.3 Data Items Needed for Future Implementation

2.3.3.1 Student Data Sheet [See Student Data Sheet, Figure 2.1]

At the present, the following data items are not used, but are stored for future implementation: Overall GPA, Curriculum GPA, Date Available for Employment, and Where Available for Employment will be used as student information by requesting companies; the Student's Permanent Address and Present Address will be used for mailing purposes, such as labels.

2.3.3.2 Employment Report [See Employment Report, Figure 2.2]

At the present, the following data items are stored for use by future implementations: the Starting Salary of a Student will be used for statistical purposes; the New Address of the Student will be used for mailing purposes.

2.3.3.3 Interview Arrangements Questionnaire [See Interview Arrangements Questionnaire, Figure 2.3]

Future implementation will involve the following stored data items: the Curriculum(s) a Company May Wish to Interview may be used as company information, in the Master Visit List and the Posting Schedule; the company name and company address may be used for reference purposes and for mailing purposes.

2.3.3.4 Date Establishment Sheet [See Date Establishment Sheet, Figure 2.4]

Future implementation will use the following stored data elements: the Company Contact Name and Contact Address, for reference purposes and for mailing purposes.

2.3.3.5 Employment Opportunity Report [See Employment Opportunity Report, Figure 2.7]

The following data items are stored for use by future implementations: Application Deadline, Job Title, Job Description, Work Location, Salary, Curriculum, Degree, Special Requirements, Contact Name, Contact Address, Contact Phone, and Contact Organization will be used as input for perspective employer information, as input for the Job Opportunity Bulletin, and as reference.

Chapter Three Design of the Database

After data analysis was completed, all the pertinent data items were stored in the data dictionary [See Appendix A]. The next step was to determine the relationships which exist among the data. This was accomplished by using the Entity-Relationship Model, a tool to express relationship decisions made by the database designer. Dependencies among data items were determined. An evaluation of the functional dependencies was made using Bernstein's Algorithm 2 to ensure that the corresponding relational database is in third normal form (3NF) and to verify that the intuition entities were correct. Each of these steps are discussed in the following sections.

3.1 Entity-Relationship Model

The Entity-Relationship Model [TEO82], known as the E-R model, is a tool used to aid the designers and ultimate users in determining data structures. It is used to model the real-world entities that a database may represent at the Career Planning and Placement Center. This model consists of entities, attributes, keys, relationships, and dependence. These terms are defined as [ULL82]:

> An entity is an element that is unique and distinguishable.
> An attribute is a set of properties of an entity.
> A key is a list of attributes that uniquely identifies an entity.
> A relationship is the association that may exist from one entity to another entity.
> Dependence is the classification of relationships according to how many entities in one entity set are associated with how many entities of another entity set. The classification may be 1-1, 1-N, M-N, where: 1-1 means each entity in either set is associated with at most one entity of the other set; 1-N means an entity may be associated with 0 or more entities in another set; M-N means there is no restriction on the sets of pairs of entities that may exist in a relationship set.

The E-R model which resulted for this database, is decomposed into the following figures :

- The attributes that describe the demographic characteristics of the student [Figure 3.1] and the Student Information Model [Figure 3.2], which represents the entity student;
- The unique characteristics of the student [Figure 3.3] and the Employment Report Model [Figure 3.4];
- The demographic values of the company [Figure 3.5] and the Company Information Model [Figure 3.6], illustrating the company entity;
- The attributes of the company [Figure 3.7] and the Perspective Employer Model [Figure 3.8];
- The company characteristics [Figure 3.9] and the Employment Opportunity Report Model [Figure 3.10], which represents the company entity;
- The descriptive data items of the student [Figure 3.11] and the Student Address Model [Figure 3.12];

3.2 Functional Dependencies

A functional dependency can exist between two sets of attributes if given a value for each attribute in one set no more than one value may exist for each attribute in the other set [ULL82]. Such dependencies are discovered by the database designer as a result of understanding the semantics of the data. The dependencies represent semantic constraints on the data that is entered into the database. The functional dependencies can be used in the synthetic algorithm known as Bernstein's Algorithm 2 to determine the database entities which best represent the entities of reality, to verify the intuitively defined entities represented in the E-R diagram, and to gain insight into modifications that would lead to a database which is easier to manage.

The functional dependencies are given for the Student Information relation scheme, Student Employment Information relation scheme, the Company Information relation scheme, the Perspective Employer Information relation scheme, the Employment Opportunity Information relation scheme, and the Student Address Information relation scheme. The functional dependencies are given in Figure 3.13.

Student Name	Curriculum
Student Number	Degree
Student Present Address and Phone	College
Student Permanent Address and Phone	Curriculum GPA
When Available for Employment	Overall GPA
Where Available for Employment	Graduation Date
Sex	

Figure 3.1 Attribute List for Student Information

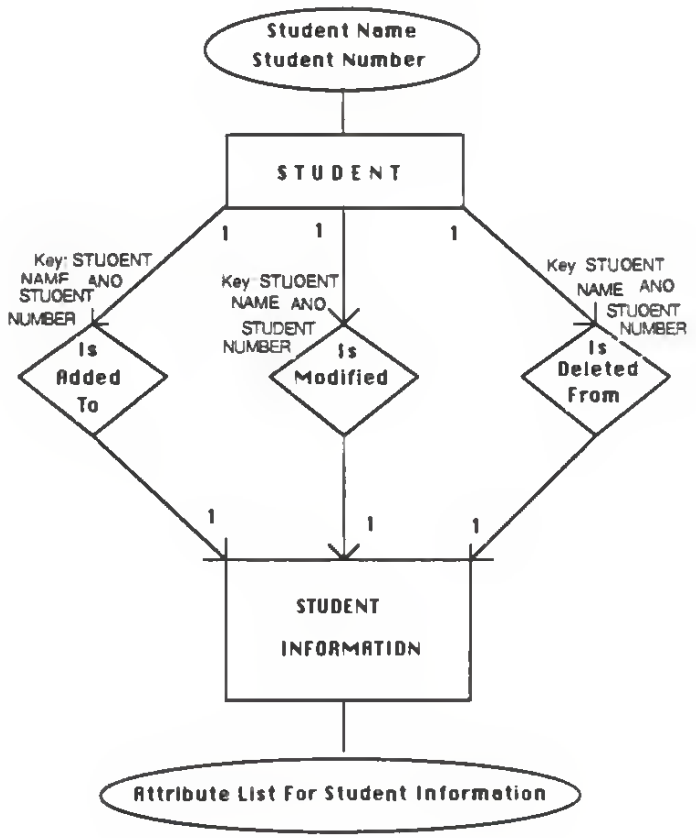

Figure 3.2 Student Information E-R Model

Date Received	Company Address
Student Name	Starting Salary
New Address of Student	Job Description
Curriculum	Hired
Degree	Seeking Employment
Graduation Date	Continuing Education
Company Name	

Figure 3.3 Attribute List Employment Information

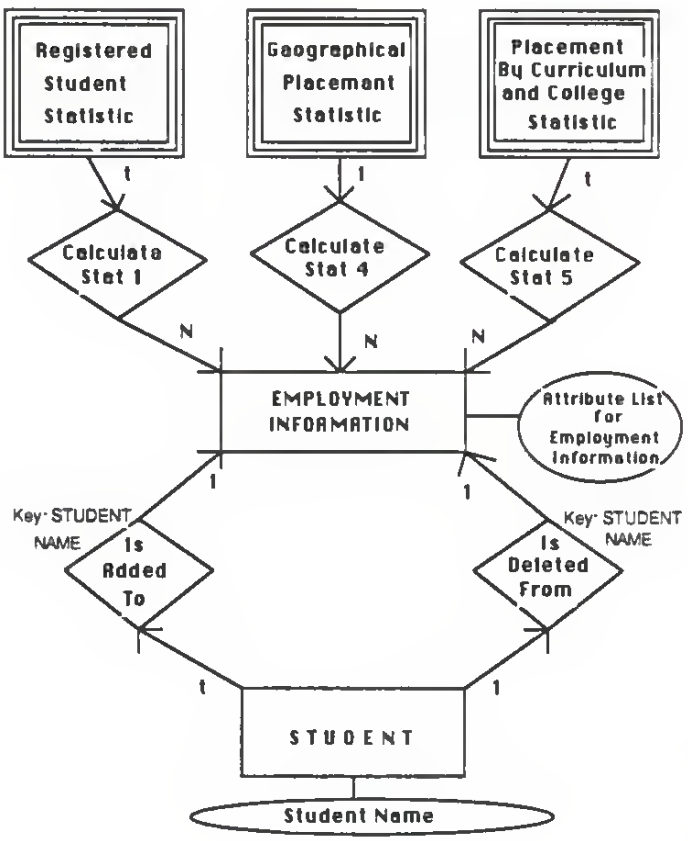

Figure 3.4 Employment Information E-R Model

Company Name
Company Address and Phone
Contact Name
Contact Address and Phone
Date Received DES
Number of Schedules
Number of Recruiters per Schedule
Interview by GPA
Interview by Curriculum
Which Curriculums Are Accepted
International Candidates Cannot be Interviewed
International Candidates Interviewed without Restriction
Interview Students Holding Permanent Resident Status
Interview U.S. Citizens Only

Figure 3.5 Attribute List for Company Information

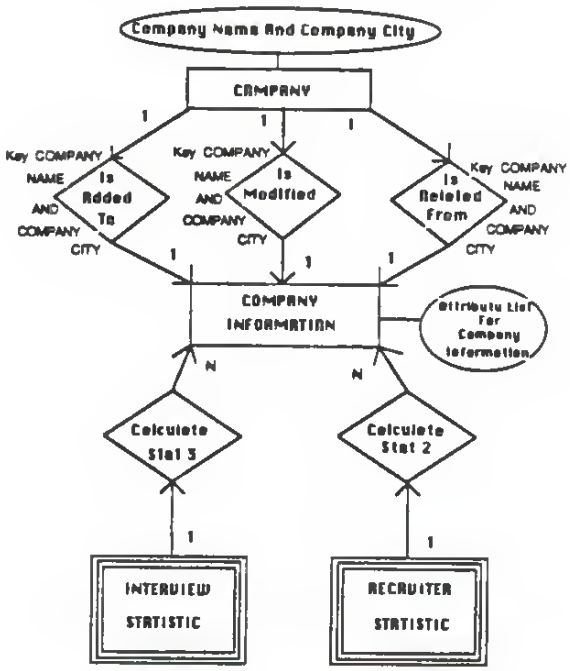

Figure 3.6 Company Information E-R Model

Company Name
Company Address and Phone
Contact Name
Title
Contact Address and Phone

Figure 3.7 Attribute List for Perspective Employer

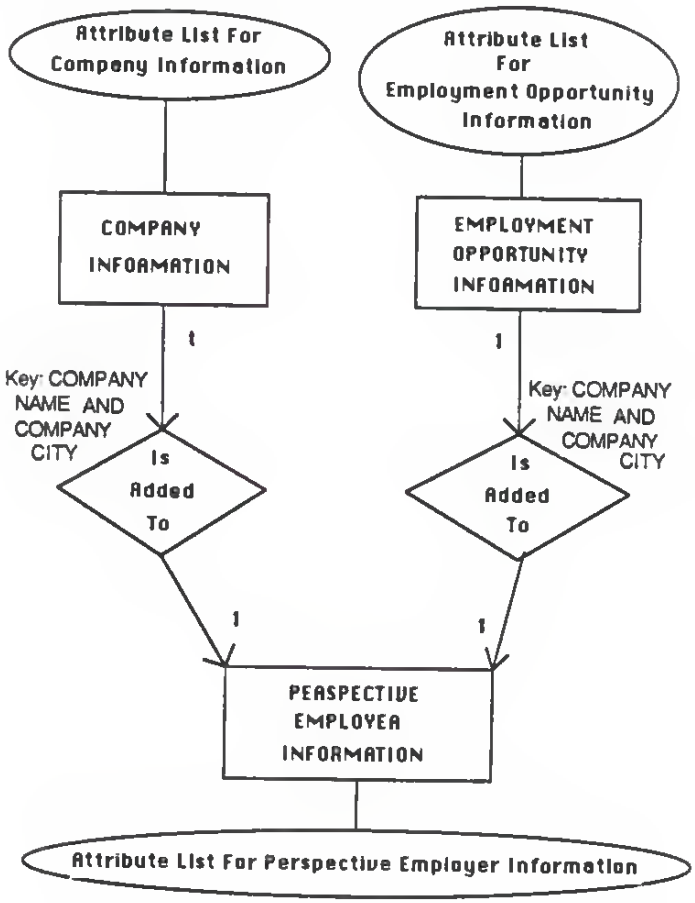

Figure 3.8 Perspective Employer E-R Model

Date Received	Job Location
Application Deadline	Salary
Job Title	Company Name
Degree	Company Address and Phone
Curriculum	Contact Name
Special Requirements	Title
Job Description	Contact Address and Phone

Figure 3.9 Attribute List for Employment Opportunity Report

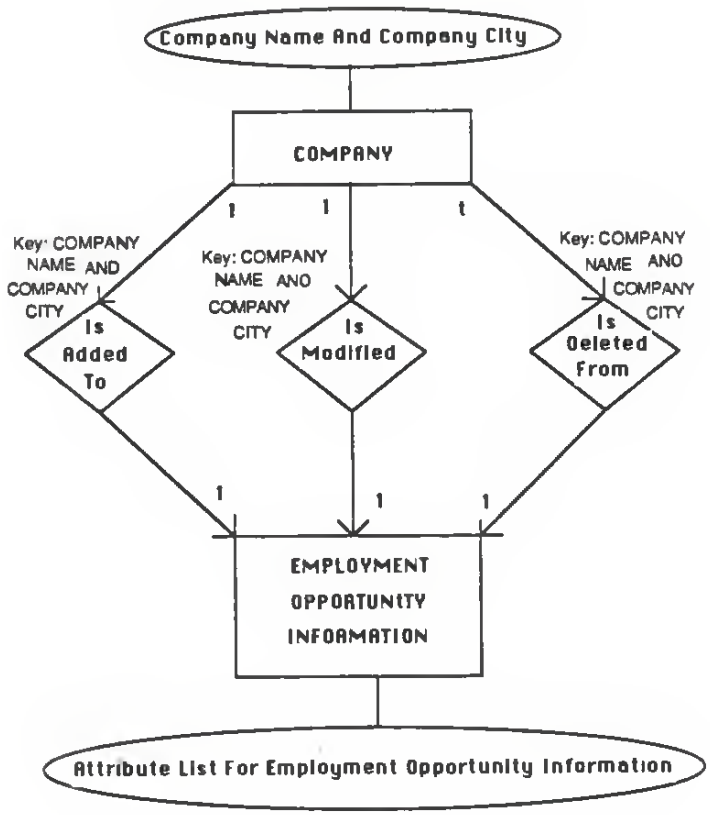

Figure 3.10 Employment Opportunity Report E-R Model

Student Name Student Number Present Address and Phone Permanent Address and Phone

Figure 3.11 Attribute List for Student Address

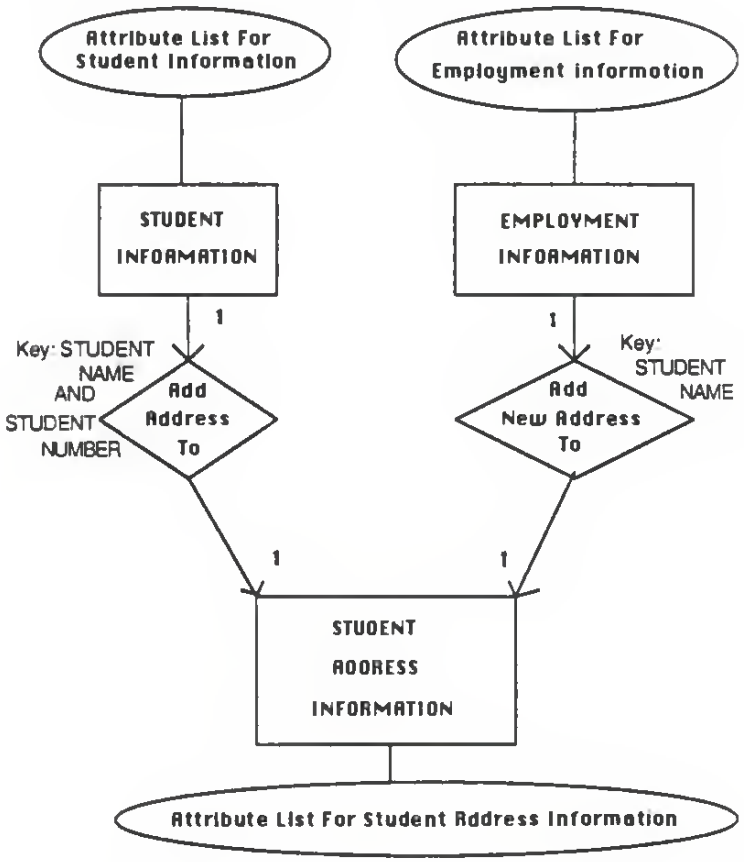

Figure 3.12 Student Address Model

Student Name and Student Number -> School Address and Phone, Permanent Address and Phone, When Available for Employment, Where Available for Employment, Overall GPA, Curriculum GPA, Sex, Curriculum, Degree, Graduation Date, and the Number of No Shows

Student Name -> Company Name, Company Address, Starting Salary, New Address of Student, Job Description, Location of Job, Curriculum, Degree, Graduation Date, Date Received Employment Report, Seeking Employment, Continuing Education, or Hired

Company Name and Company City -> Company Address, Company Phone, Contact Name, Contact Address, Contact Phone, Interview Schedule, Number of Recruiters per Schedule, Interview by Curriculum, and Interview by GPA, Which Curriculums, Interview by Specific Dates of Graduation, Date Received DES, and Special Restrictions on Students to Interview

Company Name and Company City -> Company Address, Company Phone, Contact Name, Title, Contact Address, and Contact Phone

Company Name and Company City -> Date Received EOR, Application Deadline, Job Title, Degree, Curriculum, Special Requirements, Job Description, Job Location, and Salary

Student Name and Student Number -> Present Address, Present Phone, Permanent Address, and Permanent Phone

Figure 3.13 Functional Dependencies for the Relation Scheme

3.3 Bernstein's Second Algorithm

Bernstein's Second Algorithm is a tool which can be used to determine if a given relation scheme is in third normal form. Third normal form, then, is defined as a schemata that has no attributes representing a structure or a repeating group; there may be no partial dependencies of a nonprime attribute on any key in the schemata; finally, there must not exist transitive dependencies of a nonprime attribute on any key in the schemata [UNG87].

A computerized version of Bernstein's Second Algorithm is located on the 3B5 System at Kansas State University. The program that performs this algorithm is known as the Bern2 program. The input for the Bern2 is the set of functional dependencies of the schemata, based on the intuitively defined entities. The output is a list of attributes in the

functional dependencies, a list of extraneous attributes in the functional dependencies, a list of redundant functional dependencies, the partition class set, redundant functional dependencies after adding the bijections, and the schemata in third normal form. The Bern2 results, based on the functional dependencies of Section 3.2, are given in Appendix A.

3.3.1 Bern2 Analysis

The results of the Bern2, based on the functional dependencies of Section 3.2, indicate some extraneous attributes and redundant functional dependencies.

The attributes curriculum, degree, and graduation date are extraneous. These data items are over-specified; that is, these items occur in student information and employment information as input. The redundant functional dependencies involve the dependencies that determine curriculum, degree, and graduation date.

The attributes company address, company telephone, contact name, contact address, and contact telephone are extraneous. These data items are over- specified; that is, these items occur in company information and the perspective employer information as input. The redundant functional dependencies involve the dependencies that determine the company address and contact address data items.

3.4 Relational Database

A relational database is a set of all the relations in the schemata [UNG87]. The relations may have a finite set of attributes and a finite set of tuples.

The relational database for this implementation project, where each relation represents an entity, is defined as:

R1 (Company Name, Company City, Company Address and Phone, Contact Name, Contact Address and Phone, Interview Schedules, Number of Recruiters, Interviewing by Curriculum, Interviewing by GPA, Which Curriculums, Interviewing by Specific Dates of Graduation, and Special Restrictions)
Key: Company Name and Company City

R2 (Student Name, Student Number, Present Address and Phone, Permanent Address and Phone, When Available for Employment, Where Available for Employment, Overall GPA, Curriculum GPA, Sex, Curriculum, Degree, Graduation Date, and Number of No_Shows)
Key: Student Name and Student Number

R3 (Student Name, Company Name, Company Address, Starting Salary, New Student Address, Job Description, Location of Job, Curriculum, Degree, Graduation Date, Seeking Employment, Hired, and Continuing Education)
Key: Student Name

R4 (Company Name, Company City, Company Address and Phone, Contact Name, Title, and Contact Address and Phone)
Key: Company Name and Company City

R5 (Company Name, Company City, Date Received EOR, Application Deadline, Job Title, Degree, Curriculum, Special Requirements, Job Description, Job Location, and Salary)
Key: Company Name, Company City

R6 (Student Name, Student Number, Present Address and Phone, and Permanent Address and Phone)
Key: Student Name and Student Number

Chapter Four Implementation

After the third normal form entities was determined, the conceptual form of the database for the Center project was complete. This chapter describes the following steps. The next step was implementation. Selection of a database management system was made. The data structures were built. Commentary is also given on how well the implemented database functions.

The DBMS selected for this project was dBaseIII. The justification for using dBaseIII is given in the next section.

4.1. Justification for dBaseIII

dBaseIII was selected as the database management system for this project because of the powerful programs that can be produced using this tool [TOW85]. Since dBaseIII contains its own programming language, this allowed the designer/ implementor to produce complex programs that were necessary for this project. dBaseIII provides strong typechecking. This allowed the designer to create "user-friendly" input templates, to avoid incorrect data input. Also, the number of fields in a database structure can be as many as 128; this is important for future implementations, as the Center may wish to store additional information. Another reason dBaseIII was chosen for this project is that dBaseIII is a structured language that is based on top-down design. Programs and data are relatively independent of one another. Data structures may be changed without having to make many program changes. Programs are generally shorter and easier to read. This is important for future implementations.

4.2 Database Structures

In dBaseIII, a database file is indicated by a file name followed by the suffix- .dbf. Figure 4.1 provides a list of the database files that have been created for this implementation

project and each of the entities represented by these files.

sinfo.dbf	-	student information database [Figure 4.1]
compinfo.dbf	-	company information database [Figure 4.2]
ereport.dbf	-	student employment information database [Figure 4.3]
perspemp.dbf	-	perspective employer database [Figure 4.4]
eoreport.dbf	-	employment opportunity report database [Figure 4.5]
saddress.dbf	-	student address database[Figure 4.6]

Figure 4.1 List of Database Files and Entities

The files created in this implementation are sinfo.dbf, compinfo.dbf, and ereport.dbf. A commentary on how well each of the files works is given in the following sections.

The databases that have been created but not used in this implementation project are perspemp.dbf, eoreport.dbf, and saddress.dbf. Future implementations using these databases are given in Chapter Five.

4.2.1 Student Information File, Sinfo.dbf

The database file sinfo.dbf, given in Figure 4.2, is used for student information. This information is taken from the Student Data Sheet.

This file is composed of 26 fields, for a total of 190 bytes per record. The number of fields can be reduced to 16 fields if the student's present address, present telephone number, permanent address, and permanent telephone number are moved to the saddress.dbf database [see Chapter 5].

Strong typechecking is provided by the designer/implementor by using input templates, designed to be "user-friendly". These templates are used to guarantee correct data input by

the user.

The key for this database file is the concatenation of the student name and the student number.

4.2.2 Employment Information, Ereport.dbf

The database file ereport.dbf, given in Figure 4.3, represents student employment information. This information is taken from the Employment Report. For this project, a student must have a record in the sinfo.dbf database, that is, the student must have turned in a Student Data Sheet, before the student's data may be entered into the database ereport.dbf.

The database ereport.dbf is composed of 24 fields, for a total of 236 bytes per record. The number of fields can be reduced to 20 fields if the student's new address is moved to the saddress.dbf database, and the curriculum, degree, and graduation date are stored in the student information database file, sinfo.dbf [see Chapter Five].

All data items that are input by the user have been typechecked by the use of "user-friendly" input templates, to guarantee correct type of data input.

The key for this database file was the student name.

4.2.3 Company Information File, Compinfo.dbf

Compinfo.dbf, given in Figure 4.4, is used to collect company information. This information is taken from the Date Establishment Sheet and the Interview Arrangements Questionnaire.

This database file is composed of 56 fields, for a total of 385 bytes per record. The number of fields can be reduced to 45 fields if the company address (except city), company telephone number, contact name, contact address, and contact telephone number are moved to the perspective employer database, perspemp.dbf [see Chapter 5].

Input templates are used by the designer/implementor for strong typechecking. These

"user-friendly" templates ensure that the data inputted by the user is of the right type.

The key for this database file is the concatenation of the company name and the company city.

4.2.4 Other Databases

The database files perspemp.dbf, eoreport.dbf, and saddress.dbf have been designed, but are not used in the implementation. The database file structures are given in the figures 4.5, 4.6, and 4.7.

SSN	Character	9
Reg-flag	Logical	1
P-Street	Character	20
P-City	Character	15
P-State	Character	2
P-Zip	Character	9
P-Phone	Character	10
Availemp	Date	8
Locatemp	Character	2
Over-GPA	Numeric	5
College	Character	1
Mdegdate	Character	2
Slastnam	Character	15
Sfirstnm	Character	15
Smidinit	Character	1
Stud-Str	Character	20
Stud-Cit	Character	15
Stud-Sta	Character	2
Stud-ZIP	Character	9
S-Phone	Character	10
Sex	Character	1
No-Shows	Numeric	2
Curriculum	Character	5
Degree	Character	3
Curr-GPA	Numeric	5
Ydegdate	Character	2

Figure 4.2 Student Information Database (sinfo.dbf)

Coname	Character	20
Costr1	Character	20
Costr2	Character	20
Cocity	Character	20
Costate	Character	2
Cozip	Character	9
Startsal	Numeric	7
Newstreet	Character	20
Newtown	Character	20
Newstate	Character	2
Newzip	Character	9
Slastnam	Character	20
Sfirstnm	Character	20
Smidinit	Character	1
Job	Character	20
Hired	Logical	1
Location	Character	2
Received	Date	8
Curriculum	Character	5
Degree	Character	3
Seekempl	Logical	1
Moreeduc	Logical	1
Mdegdate	Character	2
Ydegdate	Character	2

Figure 4.3 Student Employment Information Database (ereport.dbf)

Coname	Character	30
Costr1	Character	20
Costr2	Character	20
Cocity	Character	20
Costate	Character	2
Cozip	Character	9
Conumber	Character	9
Cotype	Character	24
Des-cname	Character	30
Des-str1	Character	20
Des-str2	Character	20
Des-city	Character	20
Des-state	Character	2
Des-zip	Character	9
Des-cphone	Character	10
Des-date	Date	8
No-sched	Numeric	2
Sched1	Character	6
Sched2	Character	6
Sched3	Character	6
Sched4	Character	6
Des-inits	Character	2
Cophone	Character	10
Cancelcnt	Numeric	2
Recruit1	Numeric	2
Recruit2	Numeric	2
Recruit3	Numeric	2
Recruit4	Numeric	2
Bycurr	Logical	1
Bygpa	Logical	1
Whichcurr1	Character	5
Whichcurr2	Character	5
Whichcurr3	Character	5
Whichcurr4	Character	5
Whichcurr5	Character	5
Sched5	Character	6
Sched6	Character	6
Sched7	Character	6
Recruit5	Numeric	2
Recruit6	Numeric	2
Recruit7	Numeric	2
Workloc	Character	14

Gradinvit1	Character	2	Suminvit1	Logical	1
Gradinvit2	Character	2	Suminvit2	Logical	1
Gradinvit3	Character	2	Suminvit3	Logical	1
Gradinvit4	Character	2	Suminvit4	Logical	1
Suminvit5	Logical	1	Suminvit6	Logical	1
Interwo	Logical	1	Uscitonly	Logical	1
Permres	Logical	1	Cantinter	Logical	1

Figure 4.4 Company Information Database (compinfo.dbf)

Contact	Character	30
Cstr1	Character	20
Cstr2	Character	20
Ccity	Character	20
Cstate	Character	2
Czip	Numeric	9
Cphone	Numeric	10
Coname	Character	20
Costr1	Character	20
Costr2	Character	20
Cocity	Character	20
Costate	Character	2
Cozip	Numeric	9
Cophone	Numeric	10
Title	Character	20

Figure 4.5 Perspective Employer Database (perspemp.dbf)

Received	Date	8
Deadline	Date	8
Jobtitle	Character	30
Degree	Character	20
Curriculum	Character	20
Specreqmts	Character	40
Jobdescrpt	Character	40
Worklocale	Character	30
Salary	Numeric	7
Coname	Character	20
Cocity	Character	20

Figure 4.6 Employment Opportunity Report Database (eoreport.dbf)

Firstname	Character	20
Midinit	Character	1
Lastname	Character	20
SSN	Character	9
Stud-str	Character	20
Stud-cit	Character	20
Stud-sta	Character	2
Stud-zip	Numeric	9
P-street	Character	20
P-city	Character	20
P-state	Character	2
P-zip	Numeric	9
S-phone	Numeric	10
P-phone	Numeric	10

Figure 4.7 Student Address Database (saddress.dbf)

Chapter Five Results and Future Work

The results of the implementation project and future work focus are given in the following sections.

5.1 Results

This implementation has accomplished the following:

- CR the functional needs of a major university placement center
- CR the data requirements of such an organization
- created an enterprise view of the organization based upon a third normal form analysis of the data dependencies
- created database files to collect data for each entity based on the third normal form analysis of the data dependencies of the organization
- implemented the following database files: sinfo.dbf to store student information; compinfo.dbf to store company information; ereport.dbf to store employment information
- creation of application programs for the following purposes: store, modify, and delete student information; store, modify, and delete company information; store and view employment information; calculation of recruiter statistics; calculation of registered student statistics; calculation of companies recruiting by GPA, curriculum, or both GPA and curriculum statistics; calculation of placement by curriculum statistics; calculation of geographical placement statistics
- creation of menu-driven system
- provided strong CR of input through "user-friendly" templates

5.2 Future Work

Future work in this project should focus on these areas: improvement of the implemented database, extensions of the implemented database, creation of application programs, and analysis of the operation of the organization after the Career Center has used the system for a year. Each of these areas of future work are given in the following sections.

5.2.1 Improvements

Based on the analysis of the Bern2 performed on the functional dependencies in

Chapter Three [see Appendix B], extraneous attributes and redundant functional dependencies may exist in the relation scheme designed for this implementation project. The extraneous attributes curriculum, degree, and graduation date are stored in both the student information database, sinfo.dbf, and the employment information, ereport.dbf. The redundant functional dependencies are based on these data items.

An improvement of this project would remove the extraneous attributes by storing the duplicated data items in the sinfo.dbf database. Modification of the functional dependencies is made. After this modification, the new functional dependencies are submitted as input to the Bern2 program [Appendix C]. Analysis of the modified design produced no extraneous attributes and no redundant functional dependencies. The new relation scheme is defined in the following section.

5.2.1.1 Modified Relation Scheme

The new relation scheme for this project is defined as :

R1 (Company Name, Company City, Interview Schedules, Number of Recruiters, Interviewing by Curriculum, Interviewing by GPA, Which Curriculums, Interviewing by Specific Dates of Graduation, and Special Restrictions)
Key : Company Name and Company City

R2 (Student Name, Student Number, When Available for Employment, Where Available for Employment, Overall GPA, Curriculum GPA, Sex, Curriculum, Degree, Graduation Date, and Number of No_Shows)
Key : Student Name and Student Number

R3 (Student Name, Starting Salary, Job Description, Location of Job, Seeking Employment, Hired, and Continuing Education)
Key : Student Name

R4 (Company Name, Company City, Company Address and Phone, Contact Name, Title, and Contact Address and Phone)
Key : Company Name and Company City

R5 (Company Name, Company City, Date Received, Application Deadline, Job Title, Degree, Curriculum, Special Requirements, Job Description, Job Location, and Salary)
Key : Company Name and Company City

R6 (Student Name, Student Number, Present Address and Phone, and Permanent Address and Phone)
Key : Student Name and Student Number

5.2.2 Extensions

Future extensions based on this project will implement the student address database file and the perspective employer database file. Each of these extensions are given in the following sections.

5.2.2.1 Student Address Database File

In this implementation project, the student present address and the student permanent address are stored in the student information database, sinfo.dbf. Also, the student's new address is stored in the employment database, ereport.dbf. The student address is used in correspondence to the student by the Career Planning and Placement Center.

Future implementations may use the saddress.dbf database to store the student current address and the student permanent address. It may save valuable access time storing the addresses in one database. Then, letters are generated and mailing labels may be created using the appropriate address, either student's current address or the student's permanent address.

5.2.2.2 Perspective Employer Information Database File

For this implementation project, the company address and the contact information are stored in the company information database, compinfo.dbf, and in the employment opportunity report information, eoreport.dbf. This information is used for correspondence to a company and as company information for the Master Visit List and the Interview Request Form.

A future implementation of this project may use the database perspemp.dbf. This database may contain perspective employers. It is composed of those companies that use the Placement Center for recruiting needs, companies that are listed by students on the

Employment Report, those companies that may file an Employment Opportunity Report with the Career Planning and Placement Center, companies that may be listed in classified advertisements in newspapers or magazines, and any other company that may be deemed a perspective employer by the Career Planning and Placement Center. This database may be used for correspondence with a company, generating mailing labels and letter. It is also used for correspondence with the contact person of a company, generating mailing labels and letters regarding interviews with a company. This database may be needed, to shorten the access time of a particular company address or contact data.

5.2.3 Creation of Application Programs

The database file eoreport.dbf has been created but has not been implemented. Application programs are needed to perform the following functions with the eoreport.dbf database: to insert the data of the employment opportunity report, to modify the data stored in the database, and to delete the data from the database.

Other application programs may be needed for output purposes. Application programs are needed to generate the perspective employer list, the Master Visit List, and the Job Opportunity Report Bulletin. An application program is needed to generate a listing of students based on a particular curriculum, on a particular GPA, where available for employment, or when available for employment. A program is needed to output each of the following: student information, company information, and employment information.

Application programs must be made for maintenance purposes for each of the databases.

5.2.4 Analysis

Analysis of the operation of the organization after the Career Planning and Placement Center has used the system for a year must be made. The areas of focus are:

- access time for a particular record in a database file;
- elimination of data items from a database that are not used in either information purposes or statistical purposes;
- addition of data items to a database for information purposes or for statistical purposes;
- analyze the current usage to discover changes or new needs for information.

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Appendix A

DATA DICTIONARY for Implementation Project
Career Planning and Placement Center

ACTIVITY		DATABASE
STUDENT INFORMATION	-	sinfo.dbf
EMPLOYMENT INFORMATION	-	ereport.dbf
COMPANY INFORMATION	-	compinfo.dbf
EMPLOYMENT OPPORTUNITY INFO	-	eoreport.dbf
STUDENT ADDRESS INFORMATION	-	saddress.dbf
PERSPECTIVE EMPLOYER INFORMATION	-	perspempl.dbf

NAME	:	ACCEPTABLE GRADUATION DATES (gradinvit1,gradinvit2, gradinvit3, gradinvit4)
DEFINITION	:	date of graduation of a candidate a company is willing to interview, given on the IAQ form
TYPE	:	D
FORMAT	:	D * 2
RANGE OF VALUES	:	00 - 99
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	APPLICATION DEADLINE (deadline)
DEFINITION	:	the deadline date to apply for job listed on the Employment Opportunity Report
TYPE	:	DATE
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01-12/01-31/00-99
USER RESPONSIBILITY	:	input in add eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city in employment opportunity database

NAME	:	COLLEGE (college)
DEFINITION	:	the college of a student at KSU, given on the employment report
TYPE	:	C
FORMAT	:	C

RANGE OF VALUES	:	"1","2", "3","4", "5", "6", "7" : College of Agriculture, College of Architecture and Design, College of Arts and Sciences, College of Business Administration, College of Education, College of Engineering, College of Home Economics
USER RESPONSIBILITY	:	input in add student, add an employment report
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; curriculum in curriculum database; key in college database

NAME	:	COMPANY ADDRESS (costr1 + costr2 + cocity + costate + cozip)
DEFINITION	:	company address found on IAQ form, or the employer address found on the employment report
TYPE	:	A
FORMAT	:	(A * 20) + (A * 20) + (A * 20) + (A * 2) + (D * 9)
RANGE OF VALUES	:	"a" - "Z", "0" - "9"
USER RESPONSIBILITY	:	input in add company for company information; input in add an employment report
SECURITY	:	may be altered in change company; may not be altered in employment information
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database ; student name in employment database

NAME	:	COMPANY NAME (coname)
DEFINITION	:	company name found on IAQ form; employer name found on the employment report
TYPE	:	A
FORMAT	:	A * 20
RANGE OF VALUES	:	"A" - "z"
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may not be changed in change company; may not be changed in employment information
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database; student name in employment database

NAME	:	COMPANY TELEPHONE NUMBER (cophone)
DEFINITION	:	company phone number, found on the IAQ form
TYPE	:	D
FORMAT	:	D * 10
RANGE OF VALUES	:	0000000000 - 9999999999
USER RESPONSIBILITY	:	input in add company

SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database
NAME	:	CONTACT ADDRESS (des_str1 + des_str2 + des_city + des_state + des_zip in company database) (cstr1 + cstr2 + ccity + cstate+ czip in perspective employer database)
DEFINITION	:	address of contact at company, found on DES form and the Employment Opportunity Report
TYPE	:	A
FORMAT	:	(A * 20) + (A * 20) + (A * 20) + (A * 2) + (D * 9)
RANGE OF VALUES	:	"a" - "Z", 0 - 9
USER RESPONSIBILITY	:	input in add company and add an eor
SECURITY	:	may be altered in change company; may not be altered in eor
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database and perspective employer database
NAME	:	CONTACT NAME (des_cname)
DEFINITION	:	contact name for the company, found on DES form and the Employment Opportunity Report
TYPE	:	A
FORMAT	:	A * 30
RANGE OF VALUES	:	"a" - "Z"
USER RESPONSIBILITY	:	input in add company and add an eor
SECURITY	:	may be altered in change company; may not be altered in eor
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database, perspective employer database
NAME	:	CONTACT TELEPHONE NUMBER (des_cphone)
DEFINITION	:	phone number of contact at company, found on DES form and the Employment Opportunity Report
TYPE	:	D
FORMAT	:	D * 10
RANGE OF VALUES	:	"0000000000" - "9999999999"
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may be altered in change company; may not be altered in eor
AVAILABILITY	:	Fast storage device

FD ON	:	company name and company city in company database and perspective employer database
NAME	:	CONTINUING EDUCATION (moreeduc)
DEFINITION	:	used to indicate whether a student is seeking more education, given by the student on the employment report
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	
USER RESPONSIBILITY	:	input in add an employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database
NAME	:	CURRICULUM (curriculum)
DEFINITION	:	the major field of study for a student, found on the employment report and the student data sheet
TYPE	:	C
FORMAT	:	C * 2
RANGE OF VALUES	:	'00' - '44'
USER RESPONSIBILITY	:	input in add student, add an employment report
SECURITY	:	may be altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; college in college database; curriculum in curriculum database
NAME	:	DATE RECEIVED DATE ESTABLISHMENT SHEET (des_date)
DEFINITION	:	date of arrival for the DES form
TYPE	:	DATE
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01 - 12/ 01 - 31/ 00 - 99
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may be altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database
NAME	:	DATE RECEIVED EMPLOYMENT OPPORTUNITY REPORT (received)

DEFINITION	:	the date the Employment Opportunity Report is received at the Career Planning and Placement Center
TYPE	:	DATE
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01-12/01-31/00-99
USER RESPONSIBILITY	:	input in add eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city employment opportunity database

NAME	:	DATE RECEIVED EMPLOYMENT REPORT (received)
DEFINITION	:	date a student's employment report was received
TYPE	:	DATE
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01-12/ 01-31/ 00-99
USER RESPONSIBILITY	:	input in add an employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database

NAME	:	DEGREE (degree)
DEFINITION	:	the degree a student is working on, given on the employment report and the student data sheet
TYPE	:	C
FORMAT	:	C*3
RANGE OF VALUES	:	"001","010", "100" (Bachelor, Master, Doctorate)
USER RESPONSIBILITY	:	input in add student, add an employment report
SECURITY	:	may be altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; student name in employment database

NAME	:	DESCRIPTION OF JOB (jobdescrpt)
DEFINITION	:	the description of the job, listed on the Employment Opportunity Report
TYPE	:	C
FORMAT	:	C * 40
RANGE OF VALUES	:	'a' .. 'Z'
USER RESPONSIBILITY	:	input in add an eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device

FD ON	:	company name and company city in employment opportunity database

NAME	:	DES TAKEN BY (des_inits)
DEFINITION	:	initials of secretary at Holtz Hall who takes care of DES form
TYPE	:	C
FORMAT	:	C * 2
RANGE OF VALUES	:	'A' .. 'z'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	GRADUATION DATE (mdegdate + ydegdate)
DEFINITION	:	anticipated graduation date of a student, given on the student data sheet, and the employment report
TYPE	:	D
FORMAT	:	DD/DD
RANGE OF VALUES	:	01-12/ 00-99
USER RESPONSIBILITY	:	input in add student and add an employment report
SECURITY	:	may be altered in change student; may not be altered in employment report database
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; student name in employment database

NAME	:	HIRED (hired)
DEFINITION	:	used to indicate whether a student was hired, given by the student on the employment report
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	Y/N/T/F
USER RESPONSIBILITY	:	input in add an employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database

NAME	:	INTERNATIONAL CANDIDATES CANNOT BE INTERVIEWED (cantinter)
DEFINITION	:	international candidates cannot be interviewed on campus by a company, given on the IAQ form
TYPE	:	C

FORMAT	:	C
RANGE OF VALUES	:	'y'/'Y'/'n'/'N'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may be altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	INTERNATIONAL CANDIDATES INTERVIEWED WITHOUT RESTRICTION (interwo)
DEFINITION	:	international candidates interviewed without restriction, given on the IAQ form
TYPE	:	C
FORMAT	:	C
RANGE OF VALUES	:	'y'/'Y'/'n'/'N'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	INTERVIEW BY CURRICULUM (bycurr)
DEFINITION	:	whether a company wishes to interview by curriculum, found on the IAQ form
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	'Y'/'N'/'T'/'F'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	INTERVIEW BY GPA (bygpa)
DEFINITION	:	whether a company wishes to interview by gpa, found on the IAQ form
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	'Y'/'N'/'T'/'F'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	INTERVIEW STUDENTS HOLDING PERMANENT RESIDENT STATUS (permres)
DEFINITION	:	a company is willing to interview international students holding permanent resident status, given on the IAQ form
TYPE	:	C
FORMAT	:	C
RANGE OF VALUES	:	'y'/'Y'/'n'/'N'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	INTERVIEW U.S. CITIZENS ONLY (uscitonly)
DEFINITION	:	a company is willing to interview U.S. citizens only, found on the IAQ form
TYPE	:	C
FORMAT	:	C
RANGE OF VALUES	:	'y'/'Y'/'n'/'N'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database
NAME	:	JOB DESCRIPTION (job)
DEFINITION	:	brief job description, given by a student on the employment report
TYPE	:	C
FORMAT	:	C * 20
RANGE OF VALUES	:	'A' .. 'z'
USER RESPONSIBILITY	:	input in add an employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database

NAME	:	JOB LOCATION (workloc)
DEFINITION	:	work location for possible employment, found on the IAQ form
TYPE	:	C
FORMAT	:	C * 14
RANGE OF VALUES	:	'A' .. 'z'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device

FD ON	:	company name and company city in company database
NAME	:	LOCATION (worklocale)
DEFINITION	:	location of the job, listed on the Employment Opportunity Report
TYPE	:	C
FORMAT	:	C * 30
RANGE OF VALUES	:	'a' .. 'Z'
USER RESPONSIBILITY	:	input in add an eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city in employment opportunity database
NAME	:	NEW ADDRESS OF STUDENT (newstreet + newtown + newstate + newzip)
DEFINITION	:	The new address of a student found on the employment report
TYPE	:	A
FORMAT	:	(A * 20) + (A * 20) + (A * 2) + (D * 9)
RANGE OF VALUES	:	any alphanumerics
USER RESPONSIBILITY	:	input in add an employment report
SECURITY	:	may not altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment report database
NAME	:	NUMBER OF CANCELLATIONS (cancelcnt)
DEFINITION	:	number of cancellation of interviews made by a company
TYPE	:	D
FORMAT	:	D * 2
RANGE OF VALUES	:	00 - 99
USER RESPONSIBILITY	:	none
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database
NAME	:	NUMBER OF RECRUITERS PER SCHEDULE (recruit1,recruit2, recruit3,recruit4, recruit5,recruit6, recruit7)
DEFINITION	:	the number of recruiters for a specific interview, found on the DES form
TYPE	:	D

FORMAT	:	D * 2
RANGE OF VALUES	:	00 - 99
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	NUMBER OF SCHEDULES MADE (no_sched)
DEFINITION	:	Number of Schedules made by a company, found on the DES form
TYPE	:	D
FORMAT	:	D
RANGE OF VALUES	:	0 - 4
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	OVERALL GPA (over_gpa)
DEFINITION	:	the cumulative gpa of a student, given on the student data sheet
TYPE	:	D
FORMAT	:	D.DDD
RANGE OF VALUES	:	0.000 - 4.000
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name or student number in student database

NAME	:	REGISTERED (reg_flag)
DEFINITION	:	student is registered with Holtz Hall, upon turning in student data sheet
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	"Y"/"N"/"T"/"F"
USER RESPONSIBILITY	:	input in add student
SECURITY	:	may be altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name or student number in student database

NAME	:	SALARY (salary)

DEFINITION	:	the salary offered for the job, listed on the Employment Opportunity Report
TYPE	:	D
FORMAT	:	DDDDD.DD
RANGE OF VALUES	:	00000.00 - 99999.99
USER RESPONSIBILITY	:	input in add an eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city in employment opportunity database

NAME	:	SCHEDULE DATES (sched1, sched2, sched3, sched4, sched5, sched6, sched7)
DEFINITION	:	schedule dates, found on the DES form
TYPE	:	D
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01-12/01-31/00-99
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may be altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	SEEKING EMPLOYMENT (seekempl)
DEFINITION	:	used to indicate whether a student is still seeking employment, given by the student on the employment report
TYPE	:	Boolean
FORMAT	:	C
RANGE OF VALUES	:	Y/N/T/F
USER RESPONSIBILITY	:	input in add employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database

NAME	:	SEX (sex)
DEFINITION	:	student's sex, given on the student data sheet
TYPE	:	C
FORMAT	:	C
RANGE OF VALUES	:	"M" , "F"
USER RESPONSIBILITY	:	input in add student
SECURITY	:	may be altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name or student number in student database

NAME	:	SPECIAL REQUIREMENTS (specreqmts)
DEFINITION	:	special requirements by a company for the job listed on the Employment Opportunity Report
TYPE	:	C
FORMAT	:	C * 40
RANGE OF VALUES	:	'a' .. 'Z'
USER RESPONSIBILITY	:	input in add an eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city in employment opportunity database

NAME	:	STARTING SALARY (startsal)
DEFINITION	:	starting salary for a KSU student, given on the employment report
TYPE	:	D
FORMAT	:	DDDDD.DD
RANGE OF VALUES	:	00000.00 - 99999.99
USER RESPONSIBILITY	:	input in add employment report
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device
FD ON	:	student name in employment database

NAME	:	STUDENT NAME (slastnam - sfirstnm in student database, employment database, lastname - firstname in saddress database)
DEFINITION	:	Kansas State student name found on the student data sheet and the employment report
TYPE	:	C
FORMAT	:	C * 15 + C * 15 + C
RANGE OF VALUES	:	"A" - "z"
USER RESPONSIBILITY	:	input for add student, add an employment report
SECURITY	:	no way to alter name once accepted as input
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; student name in employment database; student name and student number in saddress database

NAME	:	STUDENT NUMBER (ssn)
DEFINITION	:	student number, given on the student data sheet
TYPE	:	C
FORMAT	:	C * 9
RANGE OF VALUES	:	000000000-999999999
USER RESPONSIBILITY	:	input in add student
SECURITY	:	may not be altered
AVAILABILITY	:	Fast storage device

FD ON	:	student name and student number in student database student name and student number in saddress database

NAME	:	STUDENT PERMANENT ADDRESS (p_street + p_city + p_state + p_zip)
DEFINITION	:	The permanent address of the student, given on the student data sheet
TYPE	:	A
FORMAT	:	(A * 20) + (A * 20) + (A * 2) + (D * 9)
RANGE OF VALUES	:	All alphanumerics
USER RESPONSIBILITY	:	input in add student
SECURITY	:	may be altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student address database; student name and student number in student information database

NAME	:	STUDENT PERMANENT TELEPHONE NUMBER (p_phone)
DEFINITION	:	The phone number of a student at the student's permanent address, given on the student data sheet.
TYPE	:	D
FORMAT	:	D * 9
RANGE OF VALUES	:	0000000000-9999999999
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; student name and student number in student address database

NAME	:	STUDENT PRESENT ADDRESS (stud_str + stud_cit + stud_sta + stud_zip)
DEFINITION	:	The school address of the student found on the student data sheet
TYPE	:	A
FORMAT	:	(A * 20) + (A * 20) + (A * 2) + (D * 9)
RANGE OF VALUES	:	any alphanumerics
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database; student name and number in student address database

NAME	:	STUDENT PRESENT TELEPHONE NUMBER (s_phone)
DEFINITION	:	The phone number to reach a student in the college town found on the student data sheet
TYPE	:	D
FORMAT	:	D * 10
RANGE OF VALUES	:	0000000000 - 9999999999
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database, student address database

NAME	:	SUMMER POSITIONS AVAILABLE BY CLASS (suminvit1, suminvit2, suminvit3,suminvit4, suminvit5,suminvit6)
DEFINITION	:	class of a candidate a company is willing to interview for a summer position, given on the IAQ form
TYPE	:	C
FORMAT	:	C
RANGE OF VALUES	:	'y'/'Y'/'n'/'N'
USER RESPONSIBILITY	:	input in add company
SECURITY	:	may be altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	TITLE (jobtitle)
DEFINITION	:	job title listed on the Employment Opportunity Report
TYPE	:	A
FORMAT	:	A * 30
RANGE OF VALUES	:	all alphanumerics
USER RESPONSIBILITY	:	input in add an eor
SECURITY	:	may not be changed
AVAILABILITY	:	fast storage device
FD ON	:	company name and company city in employment opportunity database

NAME	:	TYPE OF COMPANY (cotype)
DEFINITION	:	brief description on type of company found on IAQ form
TYPE	:	A
FORMAT	:	A * 15
RANGE OF VALUES	:	"a" - "Z"
USER RESPONSIBILITY	:	input in add company

SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

NAME	:	WHEN AVAILABLE FOR EMPLOYMENT (availemp)
DEFINITION	:	date a student wishes employment, found on the student data sheet.
TYPE	:	D
FORMAT	:	DD/DD/DD
RANGE OF VALUES	:	01-12/01-31/00-99
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database

NAME	:	WHERE AVAILABLE FOR EMPLOYMENT (locatemp)
DEFINITION	:	the state a student desires employment, given on the student data sheet.
TYPE	:	C
FORMAT	:	C*2
RANGE OF VALUES	:	"A"-"Z"
USER RESPONSIBILITY	:	input in add student
SECURITY	:	altered in change student
AVAILABILITY	:	Fast storage device
FD ON	:	student name and student number in student database

NAME	:	WHICH CURRICULUMS TO INTERVIEW (whichcurr1, whichcurr2, whichcurr3,whichcurr4, whichcurr5)
DEFINITION	:	which curriculum a company wishes to interview by, found on the IAQ form
TYPE	:	D
FORMAT	:	D * 5
RANGE OF VALUES	:	00000 - 99999
USER RESPONSIBILITY	:	input in add company
SECURITY	:	altered in change company
AVAILABILITY	:	Fast storage device
FD ON	:	company name and company city in company database

Appendix B

Bern2 Program Based on Functional
Dependencies for Implementation Project
Career Planning and Placement Center

THE INPUT TO THE PROGRAM IS :

```
STUDENT-NAME, STUDENT-NUMBER  > WHEN-AVAILABLE-FOR-EMPLOY;
                  WHERE-AVAILABLE-FOR-EMPLOY;
                  SEX, COLLEGE;
                  PRES-ADDRESS, PRES-TELEPHONE;
                  PERM-ADDRESS, PERM-TELEPHONE;
                  OVERALL-GPA, CURRICULUM-GPA;
                  GRADUATION-DATE, CURRICULUM;
                  DEGREE;
STUDENT-NAME   > COMPANY-NAME, NEW-ADDRESS, CURRICULUM, DEGREE;
                  GRADUATION-DATE, JOB-LOCATION;
                  COMPANY-ADDRESS, STARTING-SALARY;
                  JOB-DESCRIPTION, HIRED;
                  SEEKING-EMPLOYMENT;
                  CONTINUING-EDUCATION;
COMPANY-NAME, COMPANY-CITY > DATE-RECEIVED-DES;
                  NUMBER-OF-SCHEDULES;
                  COMPANY-ADDRESS, COMPANY-TELEPHONE;
                  CONTACT-NAME, CONTACT-ADDRESS;
                  CONTACT-PHONE, NUMBER-OF-RECRUITERS;
                  INTERVIEW-BY-GPA;
                  INTERVIEW-BY-CURRICULUM;
                  WHICH-CURRICULUMS ;
                  INTL-CANT-INTERVIEW;
                  INTL-WO-RESTRICT;
                  INTERV-PERM-STATUS, INTERV-US-CITZ;
                  COMPANY-ADDRESS, COMPANY-TELEPHONE;
                  CONTACT-NAME, TITLE, CONTACT-PHONE;
                  CONTACT-ADDRESS, DATE-RECEIVED-EOR;
                  APPLICATION-DEADLN, JOB-TITLE;
                  DEGREE, CURRICULUM, SPECIAL-REQMTS;
                  DESCRIPTION-JOB, JOB-LOCATION;
                  SALARY;
END.
```

THIS IS THE LIST OF ATTRIBUTES WITH THEIR ABBREVIATIONS.

```
S00  STUDENT-NAME
S01  STUDENT-NUMBER
W00  WHEN-AVAILABLE-FOR-EMPLOY
```

W01 WHERE-AVAILABLE-FOR-EMPLOY
S02 SEX
C00 COLLEGE
P00 PRES-ADDRESS
P01 PRES-TELEPHONE
P02 PERM-ADDRESS
P03 PERM-TELEPHONE
O00 OVERALL-GPA
C01 CURRICULUM-GPA
G00 GRADUATION-DATE
C02 CURRICULUM
D00 DEGREE
C03 COMPANY-NAME
N00 NEW-ADDRESS
J00 JOB-LOCATION
C04 COMPANY-ADDRESS
S03 STARTING-SALARY
J01 JOB-DESCRIPTION
H00 HIRED
S04 SEEKING-EMPLOYMENT
C05 CONTINUING-EDUCATION
C06 COMPANY-CITY
D01 DATE-RECEIVED-DES
N01 NUMBER-OF-SCHEDULES
C07 COMPANY-TELEPHONE
C08 CONTACT-NAME
C09 CONTACT-ADDRESS
C10 CONTACT-PHONE
N02 NUMBER-OF-RECRUITERS
I00 INTERVIEW-BY-GPA
I01 INTERVIEW-BY-CURRICULUM
W02 WHICH-CURRICULUMS
I02 INTL-CANT-INTERVIEW
I03 INTL-WO-RESTRICT
I04 INTERV-PERM-STATUS
I05 INTERV-US-CITZ
T00 TITLE
D02 DATE-RECEIVED-EOR
A00 APPLICATION-DEADLN
J02 JOB-TITLE
S05 SPECIAL-REQMTS
D03 DESCRIPTION-JOB
S06 SALARY

THE TOKENS MARKED *TRUE* ARE EXTRANEOUS IN THE FDS :
FD NUMBER :011 TOKEN: S01 (* token represents the extraneous attribute
T graduation date in the dependency having
student name and student number as the key *)
FD NUMBER :012 TOKEN: S01 (* token represents the extraneous attribute

```
T                    curriculum in the dependency having
                     student name and student number as the key *)
FD NUMBER :013 TOKEN: S01   (* token represents the extraneous attribute
T                    degree in the dependency having
                     student name and student number as the key *)

THE REDUNDANT FDS ARE MARKED *TRUE* :
FD-NUMBR011              (* attribute is graduation date
T                    with key student name and student number *)
FD-NUMBR012              (* attribute is curriculum
T                    with key student name and student number *)
FD-NUMBR013              (* attribute is degree
T                    with key student name and student number *)
FD-NUMBR028              (* attribute is company address
T                    with key company name and company city *)
FD-NUMBR029              (* attribute is company telephone
T                    with key company name and company city *)
FD-NUMBR030              (* attribute is contact name
T                    with key company name and company city *)
FD-NUMBR031              (* attribute is contact address
T                    with key company name and company city *)
FD-NUMBR032              (* attribute is contact phone
T                    with key company name and company city *)

THE FOLOWING FDS HAVE THE SAME LHS AND ARE THEREFORE GROUPED TOGETHER
INTO PARTITION CLASSES:

PARTITION CLASS-NUMBER 001:055054053052051050049048047046045044043042
041040039038037036035034033027026
PARTITION CLASS-NUMBER 002:010009008007006005004003002001
PARTITION CLASS-NUMBER 003:014015016017018019020021022023024025
001
002
003

THE FOLLOWING FDS ARE REDUNDANT AFTER ADDING THE BIJECTIONS TO THE
FD STRUCTURE :
```

THIS IS THE SCHEMA IN 3NF :

(COMPANY-CITY COMPANY-NAME) > SALARY JOB-LOCATION DESCRIPTION-JOB
SPECIAL-REQMTS CURRICULUM DEGREE
JOB-TITLE APPLICATION-DEADLN
DATE-RECEIVED-EOR CONTACT-ADDRESS
CONTACT-PHONE TITLE CONTACT-NAME
COMPANY-TELEPHONE COMPANY-ADDRESS
INTERV-US-CITZ INTERV-PERM-STATUS
INTL-WO-RESTRICT INTL-CANT-INTERVIEW
WHICH-CURRICULUMS INTERVIEW-BY-CURRICULUM
INTERVIEW-BY-GPA NUMBER-OF-RECRUITERS
NUMBER-OF-SCHEDULES DATE-RECEIVED-DES

(STUDENT-NAME STUDENT-NUMBER) > CURRICULUM-GPA OVERALL-GPA
PERM-TELEPHONE PERM-ADDRESS
PRES-TELEPHONE PRES-ADDRESS COLLEGE
SEX WHERE-AVAILABLE-FOR-EMPLOY
WHEN-AVAILABLE-FOR-EMPLOY

(STUDENT-NAME) > COMPANY-NAME NEW-ADDRESS CURRICULUM DEGREE
GRADUATION-DATE JOB-LOCATION COMPANY-ADDRESS
STARTING-SALARY JOB-DESCRIPTION HIRED
SEEKING-EMPLOYMENT CONTINUING-EDUCATION

Appendix C

Modified Bern2 Program
Implementation Project for the
Career Planning and Placement Center

```
THE INPUT TO THE PROGRAM IS :
STUDENT-NAME, STUDENT-NUMBER  > PRES-ADDRESS, PRES-TELEPHONE;
                PERM-ADDRESS, PERM-TELEPHONE;
                WHEN-AVAILABLE-FOR-EMPLOY;
                WHERE-AVAILABLE-FOR-EMPLOY;
                SEX, COLLEGE;
                OVERALL-GPA, CURRICULUM-GPA;
                GRADUATION-DATE, CURRICULUM;
                DEGREE;
STUDENT-NAME   >  STARTING-SALARY, JOB-DESCRIPTION, JOB-LOCATION;
                HIRED, SEEKING-EMPLOYMENT;
                CONTINUING-EDUCATION;
COMPANY-NAME, COMPANY-CITY > DATE-RECEIVED-DES, NUMBER-OF-SCHEDULES;
                NUMBER-OF-RECRUITERS, INTERVIEW-BY-GPA;
                INTERVIEW-BY-CURRICULUM, WHICH-CURRICULUMS;
                INTL-CANT-INTERVIEW, INTL-WO-RESTRICT;
                INTERV-PERM-STATUS, INTERV-US-CITZ;
                COMPANY-ADDRESS, COMPANY-TELEPHONE;
                CONTACT-NAME, CONTACT-ADDRESS, CONTACT-PHONE;
                TITLE, DATE-RECEIVED-EOR, APPLICATION-DEADLN;
                JOB-TITLE, DEGREE, CURRICULUM, SPECIAL-REQTMS;
                DESCRIPTION-JOB, JOB-LOCATION, SALARY;
END.

THIS IS THE LIST OF ATTRIBUTES WITH THEIR ABBREVIATIONS.

S00  STUDENT-NAME
S01  STUDENT-NUMBER
P00  PRES-ADDRESS
P01  PRES-TELEPHONE
P02  PERM-ADDRESS
P03  PERM-TELEPHONE
W00  WHEN-AVAILABLE-FOR-EMPLOY
W01  WHERE-AVAILABLE-FOR-EMPLOY
S02  SEX
C00  COLLEGE
O00  OVERALL-GPA
C01  CURRICULUM-GPA
G00  GRADUATION-DATE
C02  CURRICULUM
D00  DEGREE
S03  STARTING-SALARY
```

J00 JOB-DESCRIPTION
J01 JOB-LOCATION
H00 HIRED
S04 SEEKING-EMPLOYMENT
C03 CONTINUING-EDUCATION
C04 COMPANY-NAME
C05 COMPANY-CITY
D01 DATE-RECEIVED-DES
N00 NUMBER-OF-SCHEDULES
N01 NUMBER-OF-RECRUITERS
I00 INTERVIEW-BY-GPA
I01 INTERVIEW-BY-CURRICULUM
W02 WHICH-CURRICULUMS
I02 INTL-CANT-INTERVIEW
I03 INTL-WO-RESTRICT
I04 INTERV-PERM-STATUS
I05 INTERV-US-CITZ
C06 COMPANY-ADDRESS
C07 COMPANY-TELEPHONE
C08 CONTACT-NAME
C09 CONTACT-ADDRESS
C10 CONTACT-PHONE
T00 TITLE
D02 DATE-RECEIVED-EOR
A00 APPLICATION-DEADLN
J02 JOB-TITLE
S05 SPECIAL-REQTMS
D03 DESCRIPTION-JOB
S06 SALARY

THE TOKENS MARKED *TRUE* ARE EXTRANEOUS IN THE FDS :

THE REDUNDANT FDS ARE MARKED *TRUE* :

THE FOLOWING FDS HAVE THE SAME LHS AND ARE THEREFORE GROUPED TOGETHER INTO PARTITION CLASSES:

PARTITION CLASS-NUMBER 001:044043042041040039038037036035034033032031030
029028027026025024023022021020
PARTITION CLASS-NUMBER 002:013012011010009008007006005004003002001
PARTITION CLASS-NUMBER 003:014015016017018019
001
002
003

THE FOLLOWING FDS ARE REDUNDANT AFTER ADDING THE BIJECTIONS TO THE FD STRUCTURE :

THIS IS THE SCHEMA IN 3NF :

(COMPANY-CITY COMPANY-NAME) > SALARY JOB-LOCATION DESCRIPTION-JOB
SPECIAL-REQTMS CURRICULUM DEGREE
JOB-TITLE APPLICATION-DEADLN
DATE-RECEIVED-EOR TITLE CONTACT-PHONE
CONTACT-ADDRESS CONTACT-NAME
COMPANY-TELEPHONE COMPANY-ADDRESS
INTERV-US-CITZ INTERV-PERM-STATUS
INTL-WO-RESTRICT INTL-CANT-INTERVIEW
WHICH-CURRICULUMS INTERVIEW-BY-CURRICULUM
INTERVIEW-BY-GPA NUMBER-OF-RECRUITERS
NUMBER-OF-SCHEDULES DATE-RECEIVED-DES

(STUDENT-NUMBER STUDENT-NAME) > DEGREE CURRICULUM GRADUATION-DATE
CURRICULUM-GPA OVERALL-GPA COLLEGE
SEX WHERE-AVAILABLE-FOR-EMPLOY
WHEN-AVAILABLE-FOR-EMPLOY PERM-TELEPHONE
PERM-ADDRESS PRES-TELEPHONE
PRES-ADDRESS

(STUDENT-NAME) > STARTING-SALARY JOB-DESCRIPTION JOB-LOCATION HIRED
SEEKING-EMPLOYMENT CONTINUING-EDUCATION

Placement Center: A Study of Database Design for an Artisan Office

by

Cathy D. Puzzuoli

B.S. West Virginia University, 1979
B.S. Kansas State University, 1985

An Abstract of a
MASTER'S REPORT

submitted in partial fulfillment of the
requirements for the degree

MASTER OF SCIENCE

Department of Computer Science

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1987

Abstract

This paper presents the conversion of a major university placement center office, in the first stage of office automation, to an information age office through the use of a database management system. The processes employed and the problems encountered in the design, implementation, results, and future work focus are discussed in light of moving an artisan office to an information age office. The present system is the initial stage of a long-term project in converting an artisan office to an information age office. The relational database is currently used for storage and retrieval of student, company, and employment information. Also, statistics are performed on student, company, and employment information. The work required to complete this initial stage is described as are some of the works needed to move to a mature information age office. The system was implemented on an IBM compatible personal computer with hard disk. The database files and application programs were implemented using dBaseIII.