A COMPARISON OF SEVEN RELATIONAL DATABASE SCHEMAS

by

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B.S., Pittsburg State University, 1978

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

Approved by:

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ACKNOWLEDGEMENTS

I would like to thank my Major Professor, Dr. Elizabeth Unger for her encouragement and extreme patience she has shown to me throughout the course of this project. I would also like to give special thanks to Dr. Virgil Wallentine and Dr. Richard McBride for graciously serving on my committee.

Special appreciation goes to my wife, Charlyn, whose help and confidence in me makes this report possible.

Chapter 1: Introduction

One of the fastest growing disciplines in computer science is in the area of data base management. Since information is such a vital part in all aspects of our lives, the management of the information, especially in business, becomes an even greater concern. The ability to retrieve the necessary data needed to solve various complexities of problems is absolutely essential in order to survive in today's world. Data base management systems (DBMS's) are software packages that provide users ways.to effectively and hopefully efficiently manage their data in order to provide answers to queries to the system.

There are three main types of logical models for databases used in data base management systems. They are hierarchical, network and relational, a common one used for personal computers. Each type of database has advantages and disadvantages so the model used depends largely on the application. The logical model used to design a database is usually either hierarchical, network or relational. The first two are better suited for accesses from multiple files to answer a query while the relational model provides greater efficiency when extracting the data from one file at a time in answering a query. In this study, the popular DBMS marketed by Ashton-Tate, dBase II will be studied within the context of a particular application. Several logical database designs for the same application will be implemented in dBase II to evaluate the design.

The use of data base management systems offers several important advantages. The data has the property of relatibility meaning that by the data being related or compatible, more information can be obtained from existing data. This decreases the cost and time needed to develop new systems. One of the DBMS's goal is to eliminate data redundancy which leads to higher data integrity. Without this, data might have to be changed in several locations in order to provide nonconflicting reports. Because of data generally being in a central location in a DBMS, ease of availability is provided along with a greater control of security. It is easier to modify data since you generally only have to go to one place instead of many. Access to the data base can be limited to only essential personnel and one can provide access restrictions on certain files or fields within the database. Another advantage to DBMS's is that of program/data independence. Programmers do not have to concern themselves with the manner in which data are stored in the database. Modification of a data structure can be made without having to change the application program.

Data base management systems as useful as they are, are not without disadvantages. Large systems can be rather expensive, costing in the hundreds of thousands of dollars. DBMS's tend to be more complex than single application systems so the high cost is partially a reflection of the more advanced programming techniques used in the design.

Large Interactive DBMS's utilize much main memory, placing a high demand for on-line storage. Backup and recovery is more difficult due to the complex nature of a DBMS and the concurrent way that database processing is done.

RELATIONAL MODEL

The relational database model is probably the easiest of the three main models for users to understand. Relations are set up in two dimensional tables having rows and columns. Each row (also called tuple), can be viewed as a record within the relation and each column as attributes. Each distinct attribute within a record is called a field. A relation or file then consists of records with each record having one or more fields. No two records can be the same in a relation. The attribute or attributes that uniquely identifies a tuple is called a candidate key with the primary key designated as a unique identifier from among the candidate keys.

The dBase II system, a relational database designed for use on personal computers, allows up to a maximum of 65,535 records/database file with as many as 1000 characters/record. They can only have a maximum of 32 fields/records and no field may contain more than 254 characters. DBase II has been commercially available since 1981 and has been one of the most popular DBMS's used in the business world ever since.

Reading database literature provides one with quite a diversity of information. Much work has been done in comparing different DBMS's products similar to dBase II. Products such as Selector V, FMS-80, Condor III along with dBase II are put through bench mark tests to compare the four basic types of databases functions - Input, Selection and Sorting, Processing, and Report generation. Speed and efficiency is measured to determine which product is best suited for the users particular needs.

Many journal articles are devoted to studying the different query languages and developing new ones in order to make it easier for the user to access the data. The query language is referred to as the data manipulation language (DML) and describes the necessary techniques used in processing the database. Ideally, the DML should be independent of any programming language. Another important concept for the DML is to allow the user to deal in logical or symbolic terms rather than physical addresses. This allows application programs to be written without concern for data structures.

The data definition language (DDL) is a non-procedural language that describes the database. It specifies the name and type of each field, the way the fields are grouped into records, and indicates keys. The DDL is used to describe the schema that represents the overall logical structure of the database.

Within the vast literature, very little information can be found on the comparison of different schemas for the same application using the same database management system. This is a prime reason for this research work.

The problem that is investigated will be the comparison of seven different schemas for one application using dBase II as the database management system. Emphasis is placed on the overall efficiency of the schemas to determine which ones are best suited for online type applications and which ones for batch related queries. Efficiency is measured by two items, the lines of code necessary for each application program written for each of the seven schemas, and the time required to execute the individual application programs. From these determinations it will provide some guidance to database designers to predict the type of schema needed for a particular kind of application with these efficiency needs.

The schemas used in this study were designed by students from the graduate database management class at Kansas State University. The students were all employees of Western Electric with an above average work experience in computer science and its related fields. Each set of three to five students were responsible for designing a separate schema and implementing it using dBase II. The same application environment was given to each set of students. The schemas used were not modified except where needed in order for my application programs to be implemented.

Following, will be a brief summary of the contents in this paper:

Chapter one is the introduction. Specific terms relating to databases and database management systems have been mentioned. Advantages and disadvantages of DBMS's are discussed along with the three main types of database models. The relational model is given closer attention because the relational DBMS, dBase II, will be used throughout the paper. The problem is presented with a brief explanation to how the answer will be resolved. Possible conclusions drawn from the results obtained are also briefly discussed.

Chapter two is the detailed discussion of the application environment. The schemas were all designed based upon the needs of a pseudo insurance company. The specific documents essential for the gathering of data for the insurance company are discussed. The functions required for the ongoing daily business of the insurance company are provided as well as the functions that were selected for comparison of the schemas. Specifics on the data used in implementation is given. The hardware environment is also discussed.

Chapter three includes detailed descriptions of the seven different schemas. Entity relationship diagrams will accompany each schema. The schema will be implemented using dBase II therefore the descriptions will include information on the fields within a record and how each attribute is defined.

Chapter four covers the details of implementation and problems that occured. Any modifications to the original schemas required for implementation are discussed.

Chapter five is the key section of this paper. In it, the main analysis of the schemas is done based on the results of the comparisons. Individual schemas will be compared to one another on the basis of the number of lines of code that are essential for the implementation of two separate applications and the execution time of each. Both applications will be discussed in detail. One will be chosen to display on-line (interactive) characteristics of a database and the other to show batch related processing. Recommendations for using a certain type of schema with a particular application will be determined.

Chapter six summarizes the final results obtained from this research. Comments are also made on the general performance of dBase II with mention of its positive qualities as well as its limitations. Possible areas of future research are touched upon.

Little is known about the efficiency of code used in relational database management systems such as dBase II. The research done for this paper will provide a better comprehension as to the effect a schema design has on the efficiency of relational database processing.

Chapter 2: Application Environment

The seven schemas used in this study were all designed for one application environment. They resulted from different perspectives the design groups took during the project. Specifics involved with data used in implementation are discussed as well as the specific functions that were chosen to compare the different schemas.

The application environment centers around the functions and requirements of a pseudo-insurance company. The agency has one general agent whose primary responsibility is to all the various insurance and investment companies for which the agency sells products. There are two subagents who answer directly to the general agent and an office manager who manages the office staff.

An insurance company generally sells more than one line of product in order to offer a well balanced portfolio to its prospective clients. This agency sells products for three insurance companies, annuities for two companies and Individual Retirement Accounts (IRA's) for three companies. The agency must be able to expand because occasionally more companies will be added. The agency must be able to expand to offer different types of products such as securities.

Each agent is licensed to sell a type of product. A commission is acquired for each product sold but is dependent of the type of product and the company offering it. Commissions to agents are always a percentage of the client payment. Override commissions are paid to the general agent on all products sold by the agency. The override commission is determined by the product and the company and is expressed as a percentage of the client payment.

In order to gather all the data the agency needs, seven documents are used. These are as follows: 1) a client file card (figure 2.1), 2) the insurance application (figure 2.2), 3) client asset sheet (figure 2.3), 4) estate settlement worksheet (figure 2.4), 5) cash flow statement (figure 2.5), 6) pro forma cash flow statement (figure 2.6), 7) statement of financial position (figure 2.7), and policy record (figure 2.8).

The client file card is one of the documents most used by the agent. It forms an easy access file for the agent and is used to respond to phone requests by the client and for information to meet most all of the daily reminder events.

The life insurance form is filled out and sent to the home office whenever insurance is requested. A copy of the form is kept in the clients folder. Most of the data on the insurance form is unnecessary for continuous interaction with the client. The most important data is the type and amount of insurance and the specific information found on the policy record.

The client asset sheet is used as an important data collection document. The data is used by the agents to prepare a financial analysis on each client. This document is stored with the client file and should be updated annually.

The estate settlement work sheet is created for each spouse as a complimentary service to its clients. The financial analysis is provided for both husband and wife where appropriate.

The cash flow statement is given to each client as a helpful aid to determine the amount of money that they can use on investments and insurance. This document and the pro forma cash flow statement are filled out by the client.

To provide a detailed financial analysis, the statement of financial position is filled out by the client to be used by the agent.

The policy record sheet is a document that is often referenced by the agency because it contains information on all the policies that the client has in force. This information is used to assist the agent in preparing the annual review. Cash value on policies change annually which must be reflected in the policy record sheet.

Reports are vital for an insurance agency to continue to exist profitably. Several reports are needed by this agency with the purpose for each one given.

The daily contact report is a reminder system that informs the agents and secretaries of events that will occur such as appointments and specific items of business to be done on a certain day. Reminder events such as annual reviews for clients, policy insurance follow up, client courtesy cards (birthday greetings), and premiums to be paid. These events can be added to the daily card up to one year prior to the day they must be processed.

Most events added to the daily contact file may be generated automatically. Annual reviews should be scheduled at one year intervals from the date of the last review. A reminder to schedule the annual review appointment should be inserted one week before a year has elapsed since the last review. Most of the client courtesy cards are birthday cards. A reminder should be inserted into the file at least three working days prior to the actual birthday.

Client follow up for insurance can also be scheduled automatically. The procedure begins when an application form is recieved by the office manager from the home office of the insurance company. The secretary should be reminded to call the home office of the insurance company after five working days has elapsed to see if the doctor's follow up to the application form has been received. If it has then no additional reminder is necessary. The secretary should call the doctor's office immediately if the follow up has not been received. If the doctor's office says they have sent the form then the secretary should be reminded in two days to call the home office. All calls are recorded in the client's record for the agent's information.

Another automated function is the reinstatement follow up for insurance. This process is initiated when a client fails to pay a premium on time. The agent should be notified of this on the next day's daily reminder. If the client intends to reinstate the policy the secretary should be given a reminder in two weeks to check with the home office to see if the proper forms and payment have been received.

When an agent sells insurance to an out of town client, the secretary should be reminded in two weeks to check on the receipt of the application by the agency.

Replacement follow up for insurance clients is another procedure which may be semi-automatically done. The goal is to minimize the payment for the client. Two weeks after the replacement policy is sold, the secretary should be reminded to contact the home insurance office to see if the policy has been issued so the client may be immediately notified to stop payment on the replaced contract.

Prospect letters are sent daily with follow ups for these taking place three days later by the agents. If any reminder items are not accomplished, they are to be automatically scrolled to the next working day.

Several reports are required for management purposes to report the state of the business. A quarterly and annual report list the income and expenses to the agency. An entry for an expense gives the date, description, amount and the individual to whom the expense is to be charged. Income entries give the date, amount and the name of the person who brought the money into the agency. All commissions are divided by the companies before checks are sent with only the income to the general agent considered as income to the agency.

The annual report classifies expenses into categories. The categories are taxes, office supplies, wages, telephone, rent, transportation, client entertainment and gifts, education, charitable contributions, professional dues and insurance. The categories are assigned by the secretaries as data entered into the expense files.

A set of statistical reports are generated on a periodic basis. The reports list year to date information for the following items: Number of insurance sales per month, number of other sales per month, dollars of insurance coverage sold per month, dollars of premium sold per month, dollars of commissions sold per month, dollars of other products sold per month, and dollars of commissions received per month.

All the schemas were implemented using the Zenith 150 (Z-150) personal computer even though an IBM or IBM compatible product would work. The Z-150 has an 8088 microprocessor with 320K of dynamic RAM with dual disk drives having 720K bytes capacity. A Zenith composite monochrome video monitor was used. The operating system is MS/DOS. Double sided, double density soft sectored XIDEX 5 1/4" disks were used.

To implement the seven database designs, dBase II version 2.41 is used. This version has several enhancements as compared to version 2.40 of which several will be mentioned here. One of the most noticeable improvements is seen using the **INDEX** command. It no longer takes an unusually long time to index when using commands such as **APPEND**, **EDIT**, and **READ**.

When using **JOIN** in previous versions one could not **JOIN** two files together with matching field names without creating duplicate fields in the new file. If the new file exceeds 32 fields, dBase II will lock.

The specifications on dBase II v2.41 are as follows:

Records/database	65,535 max.	Numeric accuracy	10 digits
Characters/record	1,000 max.	Char. string length	254 chars. max.
Fields/record	32 max.	Command line length	254 chars. max.
Characters/field	254 max.	Report header length	254 chars. max.
Largest number	1.8×10^{63}	Index key length	100 chars. max.
Smallest number	1×10^{-63}	Expressions in Sum command	5 max.

As mentioned previously, the Z-150 was used in implementing the database designs, however, any 8080, 8085 or Z-80 based microprocessor system or an 8086 or 8088 system with CP/M-86 or MS/DOS operating system could be used. DBase II also requires at least 48K bytes of memory and at least one mass storage device.

The application environment chosen for comparing the designs involved the implementation of two separate programs for each of the seven designs. The first program compares the interactive characteristics of the databases. Given a clients name, the first program will produce a list of what policies the client has and which agent sold each policy. The second program exemplifies the batch characteristics of the schemas. It will produce a report on a monthly basis that tells the number of sales per month, total dollar amount of those sales, and the different types of insurance sold for each agent.

NAMS			BIRTHDAYS			INSURANCE
			Month	Day	Year	Owned
Residence		PHONE				$
OCCUPATION		WIFE'S NAME				$
FIRM ADDRESS	PHONE	CHILDREN				$
REFERRED BY	PHONE					$
Club, Church, Frat., Hobbies	Approx. Income $					$
BEST TIME TO SEE: At Work_____ At Home	Day Daytime_____ Evening					$
						$

CALL DATE	NEED	RESULTS	CALL DATE	NEED	RESULTS

OTHER INFORMATION

PRESENT LIFE INSURANCE

Company	Date Issued	Plan	Amount	Benefits WP	Benefits Inc	Benefits DI	Beneficiary	Premium Mode	Premium Amt.	Premium Due

Form 1144

Client File Card

FIGURE 2.1

(Check Company desired) ☐ Insurance Company
☐ Life Assurance Company

Part 1

PROPOSED INSURED — First / Middle / Last

1. NAME ______

☐ Male ☐ Married ☐ Widowed ☐ Separated
☐ Female ☐ Single ☐ Divorced

2. State and Date of Birth: State | Month | Day | Year — AGE: last birthday

3. Proposed Insured's Social Security No.

4. ADDRESS for Premium Notices:
Street, Number ______
City ______ State ______
Zip ______
c/o (if needed) ______

POLICYOWNER to be:
☐ Proposed Insured
☐ Other ______ Name of Owner ______ Age
Relationship to Proposed Insured ______
Social Security or Tax I.D. No. ______
Contingent Owner (if any) ______
(Name and Relationship to Proposed Insured) ______

Ownership shall be: (If Proposed Insured is Age 0 thru 14)
☐ Until the Insured attains the age of 21, the owner shall be the Owner named above, while living, otherwise the Contingent Owner, while living, otherwise the Insured. Ownership shall automatically transfer upon the death of the prior owner, and to the Insured on his 21st birthday.
☐ Permanent in the Owner while living, then the Contingent Owner

Each owner, during this period of ownership, shall have the power to exercise all the existing policy rights of an owner, including the right to alter the succession of owners and their interests. A "contingent owner" is the person designated to succeed to the rights of the owner should the owner die during the Insured's lifetime. If there is no Contingent Owner, the Owner's rights upon his death may be exercised by his executors, administrator or assigns.

Will any existing life or annuity contracts be lapsed, surrendered, or borrowed against, or changed if the proposed policy is issued, or has there been any such change? (If "Yes", furnish full name of issuing company) ☐ Yes ☐ No

OCCUPATION: (Also Payor's Occupation — if benefit applied for) — How long so Employed? Years / Months

9. AMOUNT

10. PLAN: (State fully, using language of Rate Book)
Base:
Rider:

11. ADDITIONAL BENEFITS (Check each benefit desired)
☐ Waiver of Premium ☐ GPO $______
☐ Accidental Death $______ ☐ Payor Benefit
☐ Children's Rider $______ ☐ ______
☐ Spouse Rider $______ ☐ ______

11a. Automatic Premium Loan Provision is contained in all policies if state law permits unless marked "NO" (except term plans and annuities) No ☐

12. ANNUITIES:
☐ Flex Prem Annuity at Retirement Age______
☐ Single Premium Deferred
☐ ______

13. DIVIDEND OPTION (Complete only on Participating Plans)
☐ Paid-Up Additions ☐ Accumulated at Interest
☐ Paid in Cash ☐ Reduce Premiums

14. PREMIUM PAYMENTS
☐ Annual ☐ Semi. ☐ Quarterly ☐ PAC ☐ GA ☐ S D

15. LIFE INSURANCE & ANNUITIES IN FORCE:

Company	Amount	Year Issued	Accidental Death

16. BENEFICIARY: Print full given names — Age — Relationship
Primary: ______
Contingent: ______
☐ Lawful children of the Insured (including any named above)
☐ Children born of or legally adopted to the marriage of the Insured and primary beneficiary (including any named above) Check only if spouse of Insured is named as beneficiary.

17. Has any person proposed for insurance: (Give DETAILS in No. 18) Yes No
a ever been declined, postponed, waivered or rated for Life or Health insurance or had reinstatement refused? ☐ ☐
b any application for any other Life insurance now pending or contemplated? ☐ ☐
c made or contemplate making any flight as a pilot or crew member of any aircraft? (If "Yes" complete A, Page 2) ☐ ☐
d engaged in, or contemplate engaging in, parachuting, hang gliding, vehicle racing, skin or scuba diving? (If "Yes" complete B, Page 2) ☐ ☐
e joined any Armed Forces or Advanced ROTC? (If "Yes" complete C, Page 2) ☐ ☐

OTHER PERSONS PROPOSED FOR INSURANCE

Names of Others to be Insured (Spouse, Children, or Payor)	Relationship to Proposed Insured	Date of Birth	State	Age	Height	Weight	Amount of Life Insurance in Force
Payor (Owner)							

Home Office Corrections or Additions: (Do not write in this space.) "NOT for use in Pa., Md., and WV"

18. Additional Information and Special Requests
Whenever more space is needed in this application, use a separate page identified by application number and signed by applicant and Proposed Insured

Form 1459 9/82

Insurance Application

FIGURE 2.2

ontinuation of the Application to

Page 2

HIS QUESTIONNAIRE IS COMPLETED WITH RESPECT TO: (Print full name)________________

'ART A — AVIATION ACTIVITIES — COMPLETE IF NO. 17c, Page 1, ANSWERED YES.

. Indicate your current, past or intended flying status:
☐ Pilot ☐ Student Pilot ☐ Crew member or observer
☐ Other

. Do you fly in any military or military reserve capacity or intend to do so? ☐ Yes ☐ No
If so, state capacity:

. Total hours flown as pilot?

. Date of last flight?

. Types of certificates held and issue dates?

. Do you have an Instrument Flying Rating?
☐ Yes ☐ No

. Have you ever been in an aircraft accident or been grounded for violation of regulations? ☐ Yes ☐ No
If "Yes", explain in Remarks

. Types of flying you do or intend to do
☐ Pleasure, personal business ☐ Scheduled airline
☐ Nonscheduled carrier ☐ Business planes
☐ Charter ☐ Flight Instruction ☐ Test-production
☐ Test-experimental ☐ Dusting, seeding, spraying
☐ Other:

9. Extent of past or anticipated flying by type of flying indicated in Question 8.

	Hours of Flying Time		
Type of Flying	Last 12 Mo	1 to 2 Yrs Ago	Next 12 Mo
Military Pilot or Crew			

10. Principal types of aircraft flown?

11. Should aviation coverage be issued for extra premium, if required? ☐ Yes ☐ No

12. REMARKS.

'ART B — HAZARDOUS SPORTS OR HOBBIES — COMPLETE IF NO. 17d, Page 1 ANSWERED YES.

1. Underwater Diving
   a. Type of diving?
      ☐ Skin ☐ Scuba ☐ Other________
   b. Do you dive commercially or intend to? ☐ Yes ☐ No
      If "yes", give details ________
   c. Number of dives in past 12 months?________
   d. Number of dives anticipated in next 12 months?________
   e. Usual depth of dive________ft. Maximum?________ft

2. Parachuting
   a. Type of jumps made?________
   b. Total number of jumps?________
   c. Number of jumps last 12 months?________
   d. Number of jumps anticipated next 12 months?________
   a. Are you a member of a parachute club? ☐ Yes ☐ No
      If "Yes", give name________

3. Hang Gliding
   a. How frequently do you hang glide?________
   b. Are you a member of an organized club? ☐ Yes ☐ No
   c. How high do you usually fly?________
   d. What is the greatest height________, distance________
      duration________flown?

4. Auto or Motorcycle Racing
   a. Type of auto racing? ☐ Stockcar ☐ Drag
      ☐ Championship ☐ Sportscar ☐ Other________
   b. Type of motorcycle racing? ☐ Hill climbing
      ☐ Championship ☐ Scramblers ☐ Other________
   c. Type of course? ☐ Track ☐ Drag strip ☐ Road
      ☐ Other ________
   d. Do you drive professionally or intend to? ☐ Yes ☐ No
   e. Number of races last 12 months?________
   f. Number of races anticipated next 12 months?________
   g. Speeds attained? ________
   h. Racing organization? ________
   Engine Make________ Displacement________
   What type of fuel is used?________ Modified?________
   Class ________

5. REMARKS.

ART C — MILITARY STATUS — COMPLETE IF NO. 17e, Page 1 ANSWERED YES.

1. Are you in the Armed Forces, National Guard or any Reserve Unit?
   ☐ Yes ☐ No
   If "Yes", complete the following:
   a. Branch________ ☐ Active ☐ Reserve
   b. Pay Grade________ ETS Date________
   c. Job classifications ________

2. Current address if different from face of application.

3. Have you volunteered for (or intend to), or received orders for, or have reason to believe that you will be assigned to hazardous overseas duty? ☐ Yes ☐ No
   If "Yes", give details in Remarks.

4. REMARKS

FIGURE 2.2. (CONT.)

	Yes	No
Does any person proposed for insurance now have, or has he ever had:		
a) Tuberculosis, asthma, disease of lungs or respiratory system?	☐	☐
b) High or low blood pressure, chest pain, heart murmur, or disease of heart or circulatory system?	☐	☐
c) Disease or disorder of the stomach, intestines or bowel, rectum, liver or gall bladder?	☐	☐
d) Paralysis, convulsion, epilepsy, disease of brain or nervous system?	☐	☐
(e) Disease of the urinary system including nephritis, kidney stone, disease of the kidneys, bladder, or prostate?	☐	☐
(f) Sugar, albumin, or blood in the urine?	☐	☐
(g) Rheumatism, arthritis, gout, or any disease of muscles, bones, or joints?	☐	☐
(h) Any disease or disorder of the eyes, ears, nose or throat?	☐	☐
(i) Cancer, tumor, syphilis, diabetes, glands, or blood disorders?	☐	☐
In the past 5 years has any person proposed for insurance:		
(a) Had or been advised to have a surgical operation?	☐	☐
(b) Had a electrocardiogram, X-ray, blood study, or other diagnostic study?	☐	☐
(c) Been a patient in any hospital, institution, or sanitarium?	☐	☐
Has any person proposed for insurance ever:		
(a) Applied for, or received pension or disability benefits?	☐	☐
(b) Been rejected for or received a medical discharge from Military Service?	☐	☐
(c) Sought advice or treatment for or been arrested for the use or possession of any narcotic, stimulant, sedative, or hallucinogenic drug?	☐	☐
(d) Had advice or treatment for use of alcohol?	☐	☐
(e) Had any parents, brothers or sisters who had heart disease, diabetes, stroke or high blood pressure?	☐	☐
Is any person proposed for insurance now under any medication or treatment?	☐	☐
Has any person proposed for insurance smoked one or more cigarettes within the last 12 months?	☐	☐

How much time has the proposed insured lost from work during the last two years because of illness or injuries? _____Weeks ☐ None

Proposed Insured Height (in shoes)	Weight	Weight one year ago (Explain any difference over 10 lbs.)
___feet ___inches	______lbs.	______lbs

	Yes	No
25. (a) Have you ever had a tumor or disease of breast, tubes, ovaries, or womb?	☐	☐
(b) Are you now pregnant? If "YES," give due date________	☐	☐

26. DETAILS OF "YES" answers (List name and address of all doctors or hospitals plus date of attacks and recoveries)

27. FAMILY RECORD — of Proposed Insured

	Age if Living	Health—Reason if Not Good	Age at Death	Cause of Death
Father				
Mother				
Brothers and Sisters				

I (we) represent that all statements and answers in this application, any supplements, additional forms or medical examinations required by , are to the best of our knowledge and belief true complete and correctly recorded and it is agreed (1) Such statements and answers are a part of the application and constitute the sole basis for issuance of any insurance hereunder (2) No information known to any agent or employee of shall be binding upon unless written on and made a part of this application, (3) EXCEPT AS STATED IN A DULY EXECUTED CONDITIONAL RECEIPT BEARING THE SAME PRINTED NUMBER AS THIS APPLICATION, A DULY EXECUTED GOVERNMENT ALLOTMENT CONDITIONAL INSURANCE CERTIFICATE BEARING THE SAME PRINTED NUMBER AS THIS APPLICATION, OR A CONDITIONAL SALARY DEDUCTION AGREEMENT RELATING TO THE PROPOSED INSURANCE AND DELIVERED TO THE APPLICANT, GRANTS NO INSURANCE UNDER THIS APPLICATION UNLESS AND UNTIL, DURING THE CONTINUED INSURABILITY OF THE PROPOSED INSURED, AND ALL OTHERS PROPOSED FOR INSURANCE HEREIN, A POLICY ISSUED ON THIS APPLICATION IS DELIVERED TO THE APPLICANT AND THE FULL FIRST PREMIUM IS PAID, and (4) Acceptance of the issued policy will constitute ratification of changes made by es Home Office Corrections or Additions except where written acceptance of nonadministrative changes is required by law

$__________ (Must Always Be Answered) has been paid to the agent named below This payment can in no way bind the Company unless and until all terms and conditions of the corresponding conditional receipt below are met.

Signed at______________ State of__________ this______ day of__________, 19______

№ 10837

I HAVE READ THE COMPLETE APPLICATION BEFORE SIGNING

____
Signature of Proposed Insured (if over age 14)

____
Signature of Policyowner if other than Proposed Insured (named in No. 5)

____
Signature of Proposed Insured Spouse (if included under SIR)

Witness ______________________
Signature of Agent

____
Signature of Policyowner and/or Payor (Juvenile Policy only)

FIGURE 2.2 (CONT.)

AGENT'S REPORT

(This information must be completed with EVERY application)

A

1. Was Inspection or Telacom ordered?________ Data________________________Attach Carbon Copies of Tickets
2. Residence Address of Proposed Insured:
   Street and No ______________________ City and State__________________
   If Rural: Lives__________ miles in a________ direction from______________on______________Road
3. Former Address (last 3 years)______________________________
4. Employer and Address ______________________________
5. Maiden name of any woman to be insured if marriage occurred within five years. ______________
6. How much insurance does spouse have? $__________

How long	
Yrs	Mos

B EXAMINATION ARRANGEMENTS BY

	Yes	No
1. Is a medical examination being arranged for?	☐	☐
2. ON__________ (Date)		
3. Name of Doctor__________ or Paramed?		
4. Is he one of our approved examiners?	☐	☐
5. If rules require, did you arrange for Second Medical exam?	☐	☐
EKG?	☐	☐
Chest X-ray?	☐	☐
Sending specimen to Home Office Reference Lab?	☐	☐
SMA-12 Blood Test?	☐	☐
__________	☐	☐

C Will any existing life or annuity contracts be lapsed, surrendered, borrowed against, or changed if the proposed policy is issued?

☐ No

☐ Yes - Complete comparison/disclosure statement required by state of application.

D

1. How long have you known Proposed Insured (Applicant if Proposed Insured is under age 15)?__________ Are you related? __________
2. Are you aware of anything about the health, habits, hobbies, environment, or mode of life which might affect insurability of Proposed Insured? ☐ Yes ☐ No
3. What is the source of income (other than income from occupation)? __________
4. Will premiums be paid from personal funds? ☐ Yes ☐ No
5. Your estimate of Proposed Insured's annual income $__________

E IF PROPOSED INSURED IS UNDER AGE 15

1. Did you see the child proposed for insurance? ☐ Yes ☐ No
2. Does the child appear in good health? ☐ Yes ☐ No
3. How long have you known the child?__________
4. How many brothers and sisters has the child? Brothers__________ Sisters__________
5. Are all brothers and sisters insured? ☐ Yes ☐ No
   If "No" give reasons__________
6. Amount of insurance in force on supporting parents? $__________
7. Remarks __________

F TO BE COMPLETED IF INSURANCE IS FOR BUSINESS PURPOSES OR FOR ESTATE CONSERVATION

_____ Business Insurance _____ Estate Conservation

1. Value of Business $______ Proposed Insured's Interest_____%
2. Proposed Insured's Compensation: Salary $________, Bonus $________, Other $________
3. Purpose of Insurance.
   - ☐ Key Person
   - ☐ Fund Buy and Sell
   - ☐ Deferred Compensation
   - ☐ Split Dollar
   - ☐ Executive Bonus
   - ☐ Estate Liquidity
4. Names of Other Stockholders, Officers and Partners and Agent of Business Insurance Carried on Their Lives
5. Approximate Value of Gross Estate $__________
6. Type of Business
   - ☐ Sole Proprietorship ☐ Partnership
   - ☐ Corporation State of Corporation__________
7. Name of Officer Signing for Corporation __________

Name and Title	Value of business interest	Percent owned	Amount now carried	Amount now applied for

If any not insured, give explanation __________

G Details to any of above questions (state question number) __________

SOURCE OF PROSPECT ☐ 1 Policyowner ☐ 2 Referred lead ☐ 3 Cold Canvass ☐ 4 Direct Mail ☐ 5 Policyowner Service lead ☐ 6 Other__________

Credit this application to__________ (Please Print) ____% Code No ______

(If split-credit) __________ (Other Agent) ____% Code No. ______

THIS REPORT MUST BE SIGNED __________ (Signature of Writing Agent)

H ANNUAL PREMIUM CALCULATION

	Premium		Units		Total
Basic Ins	$ _____	X	_____	=	$ _____
WP on Basic	$ _____	X	_____	=	$ _____
Term Riders	$ _____	X	_____	=	$ _____
WP on Riders	$ _____	X	_____	=	$ _____
ADB	$ _____	X	_____	=	$ _____
GPO	$ _____	X	_____	=	$ _____
CIR	$ _____	X	_____	=	$ _____
SIR	$ _____	X	_____	=	$ _____
_____	$ _____	X	_____	=	$ _____
ODF				=	$ _____
Total Annual Premium					$ _____
Times (X) ___ Mode Factor					$ _____

I CONFIRM THAT I HAVE DELIVERED TO THE PROPOSED INSURED The Fair Credit Reporting Act and Medical Information Bureau Notices

FIGURE 2.2. (CONT.)

Name:________________ Date of birth:____/____/____
Name:________________ Date of birth:____/____/____

Children:________________ Date of birth:____/____/____
________________ Date of birth:____/____/____
________________ Date of birth:____/____/____
________________ Date of birth:____/____/____

ASSETS

	His	Hers	Joint	Indebt.
Market Value of Home	$	$	$	$
Other Real Estate				
Personal Property				
Checking Account				
Savings Account				
C.D.'s, Money Market				
Stock, Securities				
Life Insurance				
Life Insurance				
Life Insurance				
Retirement Plan Death Benefit				

OTHER INFORMATION

Husband's Salary:________________ Wife's Salary:________________
Income need in the event of a premature death:________________
Do you have a Will:________________
Would you want an education fund:________________
Inheritance potential:________________

OBJECTIVES

Client Asset Sheet

FIGURE 2.3

Estate Settlement Worksheet

	Estimate of Cash Needed to Settla Your Estate: With Full Marital Deduction (a)	Without Marital Deduction
1. Gross Estate		
2. Less Debts, Outstanding Taxes, etc.		
3. Less Probate and Administration Costs		
4. Adjusted Gross Estete		
5. Less Marital Deduction (b)		xxxxxxxxxx
6. Less Charitabla Contributions (c)		
7. Taxable Estate		
8. Tentative Federel Estate Tex		
9. Less Federel Tax Credit (d)		
10. Approximate Fedaral Estate Tax (e)		
11. Total Cash Requirad (f)		

(a) The marital deduction does not epply if there is no surviving spouse.
(b) This emount can be aither (1) tha emount from lina 4; (2) the amount necessary to bring estete taxes to zero — Lina 4 less $225,000 for 1982; $275,000 for 1983; $325,000 for 1984; $400,000 for 1985; $500,000 for 1988 and $600,000 for 1987 end later years or (3) eny other amount.
(c) The estate must have sufficient funds to make the bequest.
(d) Use $62,800 for 1982; $79,300 for 1983; $96,300 for 1984; $121,800 for 1985; $155,800 for 1988 and $192,800 for 1987 end later yaers.
(e) Including maximum credit for state inharitence taxes. The stete taxas may excaed this credit so the total federel end state taxes may exceed this estimate.
(f) Sum of lines 2, 3 end 10.

Federal Estate Tex

	Taxable Estate	Estate Tae	% Tax in next Bracket	
	$ 10,000	$ 1,800	20%	
	20,000	3,600	22	
	40,000	8,200	24	
	80,000	13,000	26	
	60,000	18,200	28	
	100,000	23,800	30	
	150,000	38,800	32	
	250,000	70,800	34	
	500,000	155,800	37	
	750,000	248,300	39	
	1,000,000	345,800	41	
	1,250,000	448,300	43	
	1,500,000	555,800	45	
	2,000,000	780,800	49	
1985	2,500,000	1,025,800	53	(50)
1984	3,000,000	1,290,800	57	(55)
1963	3,500,000	1,575,800	61	(60)
1962	4,000,000	1,880,800	65	

Averege Probate end Administreslon Costs
(on property pesaing under the will or by the lawa of intestacy)

Probatable Estate	Probate end Adm. Costs
$ 25,000	$ 2,500
50,000	3,500
100,000	5,500
200,000	9,750
300,000	14,500
400,000	19,500
500,000	25,000
600,000	30,000
700,000	35,000
800,000	40,000
900,000	45,000
1,000,000	50,000

Not applicable to property pessing by survivorship nor to property pesing by contract to a named beneficiary, nor to property held in trust pessing by terms of the trust.

Upper limits of estate tax brackets will be reduced in yeers 1982-1985. Do not refer to tax breckets below the current year. The tax breckets in perentheses will become effective when the yeer indexed is reached. For exemple, in 1982 a taxeble estate of $3,600,000 will be in e 61% marginel tax bracket. In 1983, the seme size texeble estete will be in a 60% marginal bracket. In 1985, a taxable estate of this size or any taxeble estete in excess of $2,500,000 will be in e meximum tex bracket of 50%.

Complete the reverse side to show Estata Settlament costs if the order of death is reversed.

7333 9/81

FIGURE 2.4

Cash Flow Statement
For the Year Ending ________________

Cash Balance at Beginning of the Year		$______	
INFLOWS			
Salaries after taxes		______	
Dividends in cash		______	
Interest received		______	
TOTAL INFLOWS			$______
OUTFLOWS			
Savings and Investment		$______	
Fixed Outflows			
Mortgage note payments	$______		
Automobile note payments	______		
Insurance premiums	______		
Total Fixed Outflows		______	
Variable Outflows			
Food	$______		
Transportation	______		
Utilities/household exp.	______		
Clothes end personal care	______		
Recreation end vacations	______		
Medical and dentsl care	______		
Taxes	______		
Miscellaneous	______		
Total Variable Outflows		______	
TOTAL OUTFLOWS			$______
Cash Balance at End of the Year			$______

Cash Flow Statement

FIGURE 2.5

Pro Forma Cash Flow Statement
For the Quarter Ending ____________

	________	________	________
Cash balance at beginning of month	$________	$________	$________
INFLOWS			
Salaries after taxes	________	________	________
Dividends in cash	________	________	________
Interest income	________	________	________
Borrowed Funda	________	________	________
________________	________	________	________
________________	________	________	________
TOTAL INFLOWS	$________	$________	$________
OUTFLOWS			
Savings and Investments	________	________	________
Fixed Outflows			
Mortgage note payment	________	________	________
Automobile note payment	________	________	________
Inaurance premiums	________	________	________
________________	________	________	________
Variable Outflows			
Food	________	________	________
Transportation	________	________	________
Household Expenses (inc. util.)	________	________	________
Clothes/personal care	________	________	________
Recreation and vacations	________	________	________
Medical and dental care	________	________	________
Credit card payments	________	________	________
Miscellaneous	________	________	________
TOTAL OUTFLOWS	$________	$________	$________
NET CASH POSITION	$________	$________	$________
Additional funds needed	________	________	________
Cash Balance at End of Month	$________	$________	$________

Pro Forma Cash Flow Statement

FIGURE 2.6

Statement of Financial Position
As of ____________________

ASSETS	
Cash and Cash Equivalents	
Cash and checking account	
All-savers Certificate	
Money Market Fund	
Total Cash/Cash Equiv.	
Invested Assets	
Stocks and bonds	
Life insurance cash value	
Vested portion of pension	
Total Invested Assets	
Use Assets	
Residence	
Automobiles	
Household furnishings	
Clothing, jewelry, etc.	
Total Use Assets	
TOTAL ASSETS	

LIABILITIES AND NET WORTH	
Liabilities	
Credit card balance	
Automobile note bal.	
Mortgage note bal.	
Total Liabilities	
Net Worth	
TOTAL LIABILITIES AND NET WORTH	

Statement of Financial Position

FIGURE 2.7

POLICY RECORD

Insured's Initials	Company	Policy Number	Face Amount	Type	Date of Issue	Age at Issue	Gross Yearly Premium	Paid				APL	Div. Opt.	Loans		Cash Values						Beneficiary		Owner's Initials
																10		15		At Age				
								[illegible]	[illegible]	[illegible]	[illegible]			Amount	Int. Rate	Guar.	Total	Guar.	Total	Guar.	Total	Primary	Contingent	

[illegible]   *FOR DETAILED INFORMATION ON SETTLEMENT OPTION SEE POLICY SUMMARY FORM

Policy Record

FIGURE 2.8

Chapter 3: Logical Database Designs

In this chapter, each of the seven different database designs created by the student programming groups is examined. The design process consists of two steps a) Creation of the entity-relationship diagram and b) Determining the relational schema. Discussion of each entity-relationship diagram is provided including a general evaluation of each design to determine overall effectiveness in handling the original functional specifications (see Chapter Two). After examining each entity-relationship diagram, an evaluation is done on the corresponding relational schemas. Comparison is made to see whether redesigns of the systems occured between the formulation of the entity-relationship diagrams and the translation of them into relational schemas. If so, justification (or the probable reasons) of overhauling a particular design is given.

An entity when used in the context of databases is simply something that exists and can be distinguished from another entity. Entities have properties which are called attributes. Each attribute may take a value from a given domain. In order for entities to be distinguishable from each other, there must be something to uniquely identify them. This unique identifier is called a key if it contains no extra attributes. An entity may have more than one key.

Relationships exist among entity sets in which a relationship is simply an ordered list of entity sets. There are several classifications of relationships based on the association of one entity set to another. A one-to-one relationship occurs when there is only one associated member from one entity set to another (e.g., social security number identifies at most one person).

A many-to-one relationship exists between entity sets in which one entity in set E_2 is associated with zero or more entities in set E_1. Each entity in set E_1, however, can at most be associated with only one entity in E_2 (e.g., a father and his children).

A relationship where no restrictions are made on how many sets of entities can exist in the relationship is called a many-to-many relationship (e.g., parts and assemblies made from the parts).

An entity-relationship (E-R) diagram is a tool to graphically represent a system design. Rectangles represent the entity sets while attributes are represented by circles. Diamonds are used to represent relationships and arcs are needed to link the different entity sets.

The relational model was chosen to represent the information from the seven different E-R diagrams. To represent an entity a relation consists of all the attributes of the entity set. A relationship between entity sets is represented by a relation whose schema consists of the attributes in the keys of the entity sets.

In evaluating the overall effectiveness of each design, it is important to review the original project specifications from chapter two. The two main areas of concern for each design to be functional are the reminder system and that of the various reports required by the agency. Each design was looked at to determine whether these functions could be fulfilled.

Design one (see figure 3.1) has thirteen entities with twenty-three relationships. The entity called *activity* is a bit misleading because the attributes include *activity type* and *date scheduled*. With all the reminders wanted in the system it would be very difficult if not impossible to anticipate every activity required. To be reminded of birthdays, it would be best to start with *client* and migrate from there. It would be advantageous to have the attributes associated with *family info* to be included with the client information to reduce some overhead in maintaining the system since at the present, one has to have duplicate information in order to link *client* with *family info*. There are no attributes in the three major products (insurance, annuities, and IRA's) to tell whether the latest premium has been paid making reinstatement follow up for insurance clients impossible to do. The set of statistical reports can be adequately provided by this design.

Design two (see figure 3.2) has nine entities and ten relationships. It is noticeable that this design would not be sufficient to handle the requirements laid forth in the functional specifications. This schema is only able to manage insurance products. There is no provision for IRA's and annuities which also are sold by the agency. The design is lacking in the statistical reports it can produce. There is no field within the entity *policy* to link it with the agent that sold the policy. Because of this, one could not produce the reports dealing with commissions sold and received in a given month. Although not required in the specifications, it would be helpful to have information linking agents with their policy holders. This design has definite limitations in this area.

Design three (see figure 3.3) has seventeen entities and twenty three relationships and will perform all of the project specifications. It has an extensive reminder system and would be able to produce the required statistical reports. Several of the entities like *hobbies* and *occupational information* do not seem to have much value except for additional information that one might want to know on a particular client. By grouping all the agency employees, clients, children, and spouses under the same entity (*person*), a lot of memory will be wasted storing unnecessary data.

Design four (see figure 3.4) has nine entities and eight relationships. It is set up nicely for expansion of the companies product lines. The entity, *products sold by agency*, allows for this growth. Depending on the type of product a client owns, there may be some unnecessary associated attributes. For example, it is doubtful that IRA's would have riders and yearly premiums. The entity *daily reminder* which is related to *client* seems to be properly linked for effeciency because most reminders are generated by attributes within a clint's records. The annual income and expense reports as well as the statistical reports can be produced by this design.

Design five (see figure 3.5) has seven entities and seven relationships. The system will expand nicely also by simply adding a new type to the *products* entity. The reminder system would possibly be more efficient if it was linked more directly to the *client* entity. As it stands now, one has to migrate through *agent* to get to *client* in order to arrive at data within *client* that is needed to generate reminders. It would be very difficult to know all the appointments and annual reviews one has without first getting the information from a client's policy which in this system would be rather ineffecient.

The agency financial data is grouped within one entity, however, without date fields on the company expenses and incomes, it could cause problems when preparing a quarterly reports. Because of the way that expenses and income are grouped within the same entity, there will be wasted memory in inplementation using a relational database. The statistical report calling for the dollars of premium sold per month can not be produced because there is not a premium attribute within the *policy* entity. Most all of the other reports can be produced by this system.

Design six (see figure 3.6) has nine entities and nine relationchips. This design is one of the better systems when looking for the specifics in commissions percentages. If a company wants to change the percentage on a commission for a given product, this can easily be implemented with the current system design. The quarterly expense reports can easily be produced by this system, however, the income reports will be somewhat more difficult. One would have to determine all the policies sold within a set period of time and depending on the type of product sold and company it is sold for, the commissions would have to be calculated individually then summed together.

The reminder system would seem to work sufficiently in this design. The attribute *cl-results* makes it possible to record the results of a particular need so that one can again be reminded on a subsequent day if necessary.

Like some of the other designs, the *policy* entity is centered around insurance. If one were to have an IRA for example, there would be some extra unnecessary attributes. In general this design would be able to produce the required reports with little overhead in migration.

The last design (see figure 3.7) has ten entities and ten relationships. The E-R diagram goes into a lot of detail although there are several entities that could probably be grouped together. The *general agent* and *subagents* could be combined since they have the same attributes. It does not seem to be necessary to have separate entities for *office manager* and *office staff* with relationships joining them because there is not any useful information to obtain from them. *Spouse* and *child* could also be combined since they have the same attributes and are directly related to *client*. The entity *reports* does not seem to be serving any useful purpose. Knowing the date and type of a report does not in itself produce worthwhile information without having additional data to build the report.

The entity, *product*, should have a date field on it and possibly be linked to *client*. This design would assume that all types of a particular product would have the same price. As the design stands, it is probably the least able to allow production of the required reports. There are no basic attributes such as premium, issue date, and cashvalue on a client policy and without a date field, monthly reports could not be produced. The quarterly income and expense reports can not be produced and there is no evidence of a reminder system.

In reviewing the corresponding relational schemas for each design, it can be said in most cases that there is some overhead in maintaining relational model databases. In order to traverse through the schema, duplicate attributes must be maintained. If a value for one of these attributes ever changes, one must change every occurrence of this attribute, a drawback in maintaining relational databases.

Comparing the relational database schema to its corresponding E-R diagram, design one (see figure 3.8) is very close. There were not any major changes to the design and the attributes added as previously mentioned were for migrational purposes.

Design two (see figure 3.9) in the relational schemas solves a problem mentioned in the E-R diagram. There is the *agent* attribute in policy to link an agent with a policy making it possible to produce the commission statistical reports. The schema is still lacking in that if a new product is to be sold, expansion within the agency is limited.

The relational schema for design three (see figure 3.10) ties in very closely with its E-R diagram. Many of the entities have *name* as the key which may not uniquely identify records within the entity, one of the problems that can be seen with this schema.

There were some minor changes in relational schema number four (see figure 3.11). To properly link the *daily reminder* entity, the *client* *name* attribute was added. The remaining schema again is closely associated with its E-R diagram.

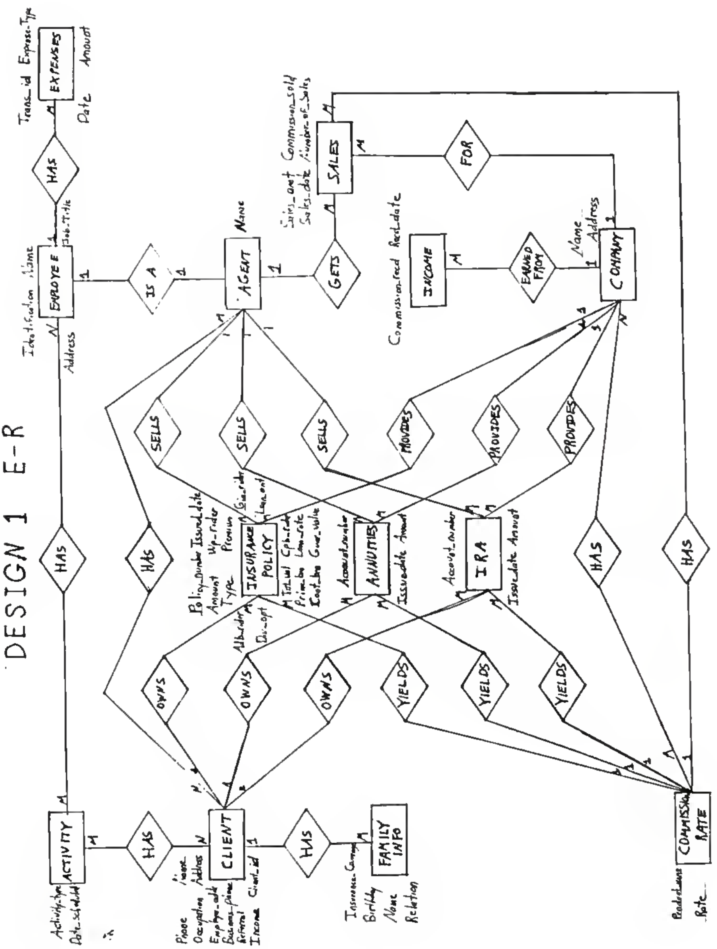
Schema number five (see figure 3.12) contains no significant changes from its E-R diagram, however, to make traversing through the database easier, a field in *policy* should be added to link a policy with a client.

Schema six (see figure 3.13) and its related E-R diagram are closely associated to each other with very few changes. The only additional attributes were the result of ones needed to link entities together.

Schema design seven (see figure 3.14) maintains its compatibility with its E-R diagram, however, there were some entities added to the E-R diagram. A major change in the design of the system would be necessary to accomodate the reports needed for the agency.

The comparison of the schemas and their related E-R diagrams are summarized in figure 3.15.

In the next chapter implementation of the application programs is done which may necessitate modifications to the current E-R diagrams. Any modifications will be included at that point.



DESIGN 1 E-R
EXPENSES
HAS
EMPLOYEE
IS A
AGENT
GETS
SALES
FOR
INCOME
EARNED FROM
COMPANY
SELLS
SELLS
SELLS
PROVIDES
PROVIDES
PROVIDES
INSURANCE POLICY
ANNUITIES
IRA
HAS
HAS
HAS
HAS
OWNS
OWNS
OWNS
YIELDS
YIELDS
YIELDS
ACTIVITY
HAS
CLIENT
HAS
FAMILY INFO
COMMISSION RATE

FIGURE 3.1

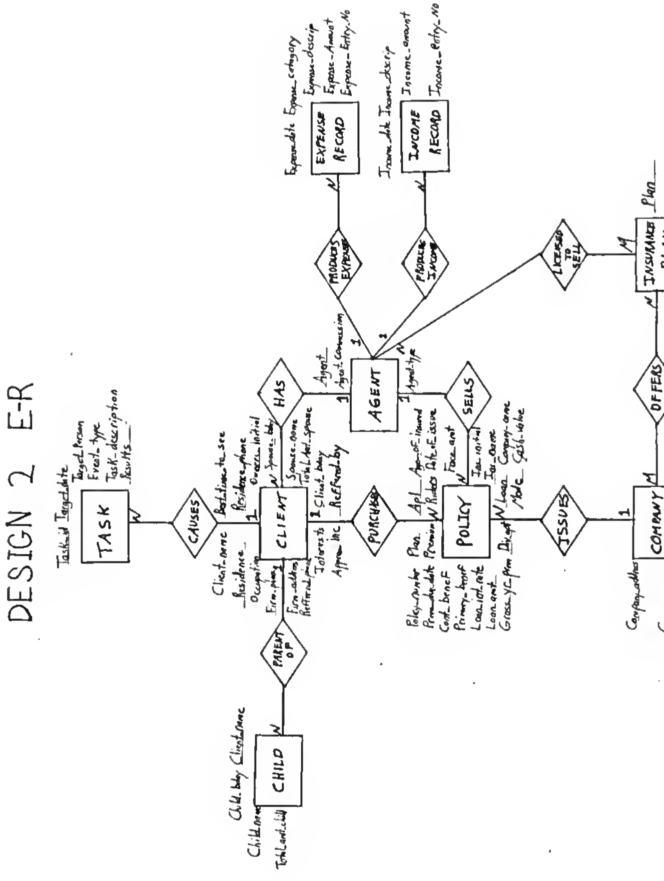

DESIGN 2 E-R
TASK
CAUSES
CLIENT
PARENT OF
CHILD
HAS
PURCHASES
AGENT
SELLS
POLICY
ISSUES
COMPANY
OFFERS
INSURANCE PLAN
LICENSED TO SELL
PRODUCES EXPENSE
EXPENSE RECORD
PRODUCES INCOME
INCOME RECORD

FIGURE 3.2

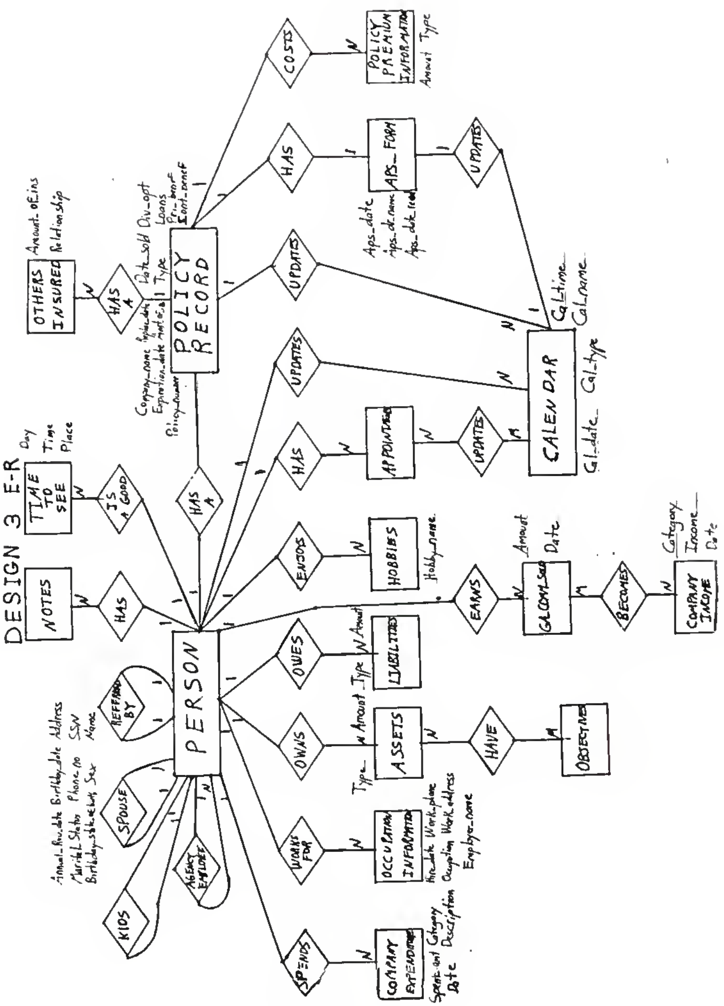

DESIGN 3 E-R
PERSON
POLICY RECORD
NOTES
TIME TO SEE
OTHERS INSURED
POLICY PREMIUM INFORMATION
APS_FORM
CALENDAR
APPOINTMENTS
HOBBIES
LIABILITIES
ASSETS
OBJECTIVES
OCCUPATION INFORMATION
COMPANY EXPENDITURES
COMPANY INCOME
HAS
IS A GOOD
HAS A
ENJOYS
EARNS
BECOMES
OWES
OWNS
HAVE
WORKS FOR
SPENDS
KIDS
SPOUSE
COSTS
UPDATES
Day
Time
Place
Amount_of_ins
Relationship
Amount Type
Aps_date
Cal_time
Cal_name
Cal_date
Cal_type
Hobby_name
Amount
Date
Category
Income
SSN
Name

FIGURE 3.3

DESIGN 4 E-R

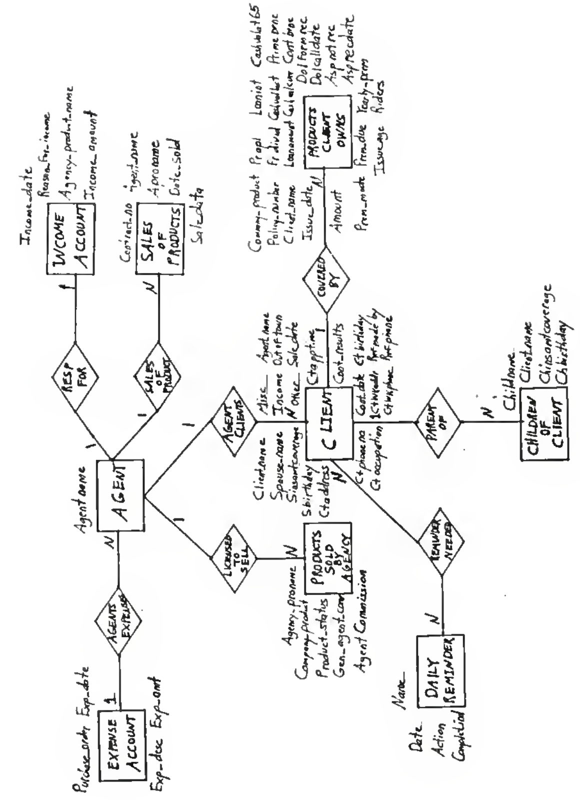


FIGURE 3.4

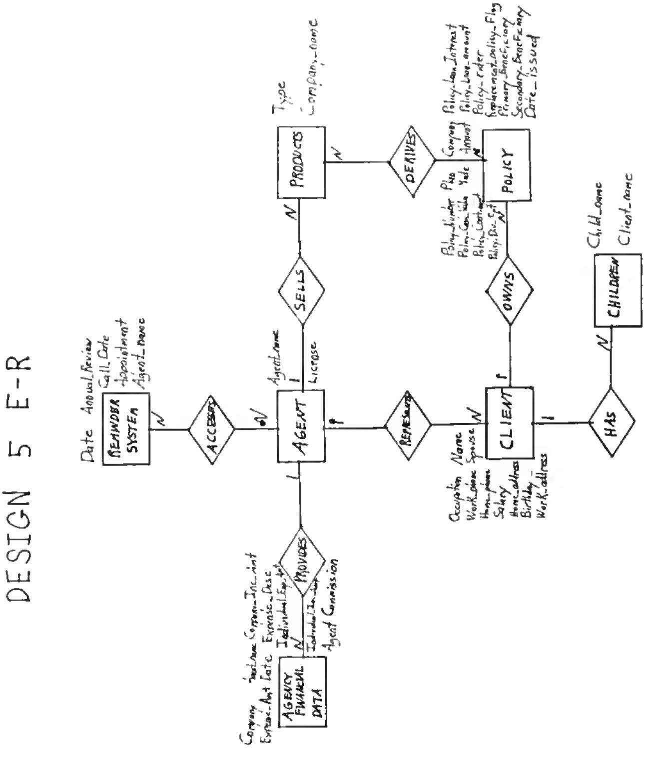

DESIGN 5 E-R
AGENT
SELLS
PRODUCTS
DERIVES
POLICY
OWNS
CLIENT
HAS
CHILDREN
PROVIDES

FIGURE 3.5

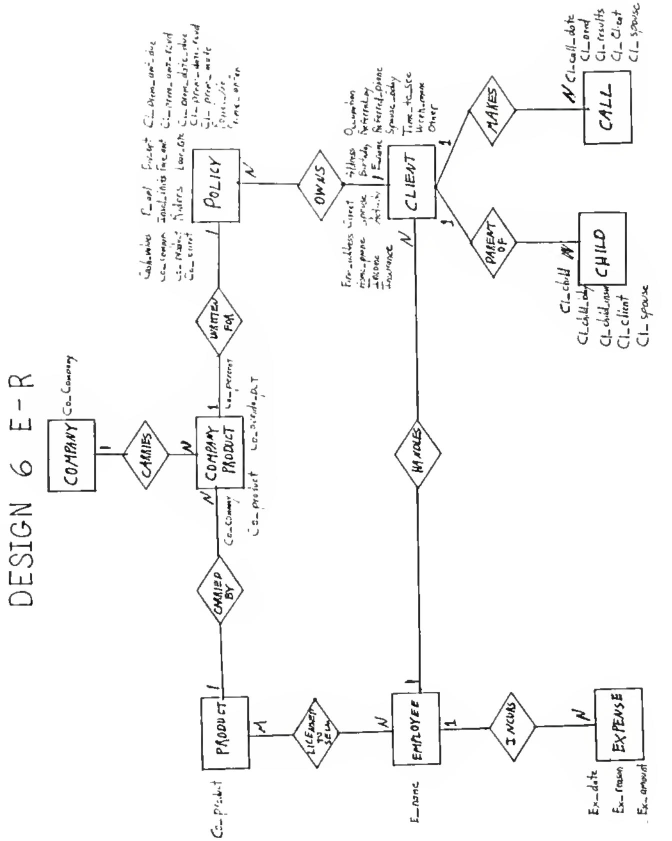

DESIGN 6 E-R
COMPANY
Co_Company
CARRIES
COMPANY PRODUCT
CARRIED BY
PRODUCT
EMPLOYEE
E_name
INCURS
EXPENSE
Ex_date
Ex_reason
Ex_amount
HANDLES
CLIENT
OWNS
POLICY
WRITTEN FOR
PARENT OF
CHILD
Cl_client
Cl_spouse
MAKES
CALL
Cl_call_date
Cl_results
Cl_client
Cl_spouse

FIGURE 3.6

DESIGN 7 E-R

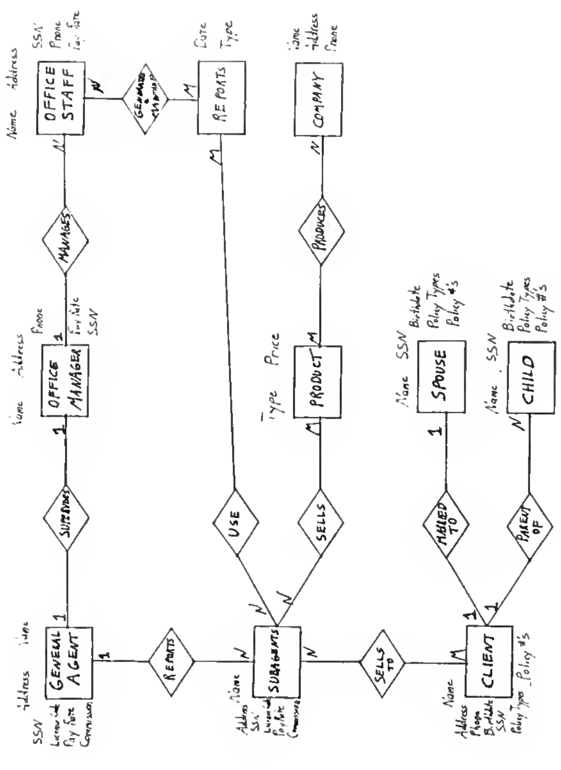


FIGURE 3.7

RELATIONAL DATABASE MODEL
DESIGN 1

ACTIVITY (client-identifier, employee-identifier, **key: activity-type, activity-date-scheduled**)

CLIENT (client-name, client-address, client-phone-number, client-occupation, client-employer-address, client-business-phone, client-referral-name, client-income, **key: client-identification**)

FAMILY-INFO (client-identification, insurance-amount, family-relation, **key: name, birthday**)

COMMISION-RATE (commission-rate, **key: product-name**)

INSURANCE-POLICY (client-identification, employee-identifier, company-name, insurance-amount, insurance-type, policy-issue-date, policy-premium, wp-rider, adb-rider, gia-rider, cpb-rider, dividend-option, policy-loan-amount, policy-loan-rate, guaranteed-value, total-value, primary-beneficiary, contigent-beneficiary, **key: policy-number,**)

ANNUITIES (client-identification, employee-identifier, company-name, annuity-issue date, annuity-amount, product-name, **key: annuity-account-number**)

IRA (client-identification, employee-identifier, company-name, ira-issue date, ira-amount, product-name, **key: ira-account-number**)

EMPLOYEE (employee-name, employee-address, job-title **key: employee-identifier**)

AGENT (**key: employee-identifier**)

INCOME (commission-received, company-name, **key: commission-received-date**)

COMPANY (company-address, **key: company-name**)

EXPENSES (employee-identifer, expense-type, expense-date, expense-amount, **key: expense-transaction-identification**)

SALES (employee-identifier, company-name, product-name, sales-amount, commission-sold, number-of-sales, **key: sales-date**)

COMPANY-RATE (**key: company-name, product-name**)

CLIENT-AGENT (**key: employee-identifer, client-identification**)

CLIENT-ACTIVITY (**key: client-identifier, activity-date-scheduled, activity-type**)

EMPLOYEE-ACTIVITY (**key: employee-identifier, activity-date-scheduled, activity-type**)

FIGURE 3.8

RELATIONAL DATABASE MODEL
DESIGN 2

CHILD (child-birthday, total-amount-child, **key: child-name, client-name**)

TASK (client-name, event-type, task-description, results, **key: task-id, target-date, target-person**)

CLIENT (agent, total-amount-spouse, spouse-birthday, spouse-name, client-birthday, referred-by, residence, residence-phone, occupation, firm-address, firm-phone, referred-phone, interest, approx-income, best-time-to-see, owners-initial, **key: client-name**)

POLICY (agent, client-name, premium-due-date, mode, contingent-beneficiary, primary-beneficiary, cash-value, loan-int-rate, loan-amount, loan, dividend-option, gross-yr-premium, plan, premium, apl, riders, age-of-insured, date-of-issue, face-amount, ins-initial, ins-name, **key: policy-number, company-name**)

COMPANY (**key: company-name, plan**)

AGENT (agent-commission, agent-type, **key: agent, plan**)

INSURANCE-PLAN (company-name, **key: plan, agent**)

EXPENSE-RECORD (agent, expense-category, expense-descrip, expense-amount, **key: expense-date, expense-entry-no**)

INCOME-RECORD (agent, income-category, income-descrip, income-amount, **key: income-date, income-entry-no**)

FIGURE 3.9

RELATIONAL DATABASE MODEL
DESIGN 3

PERSON (address, sex, phone bday, bdaystate, marital_status, **key: name, ss#)**
OCCUPATION_INFO (hire_date, occupation, work_phone, work_addr, emp_na, **key: name)**
ASSETS (amount, **key: type, name)**
OBJECTIVES **(key: type, name)**
LIABILITIES (amount, **key: type, name)**
GA_COMM_SOLD (amt, date, **key: name)**
COMPANY_INCOME (income, **key: category, date)**
COMPANY_EXPENDITURE (description, spender, amt, date, **key: category, date)**
HOBBIES (hobby_name, **key: name)**
APPOINTMENTS (**key: name)**
CALENDAR (cal_name, cal_time, **key: cal_date, cal_topic)**
POLICY_RECORD (co_name, exp_date, rep_date, amt_of_ins, date_sold, type, dividend_option, loans, primary_bin, contingent_ben, **key: policy_nd)**
APS_FORM (aps_date, aps_dr_name, aps_date_recd, **key: policy#)**
POLICY_PREMIUM_INFO (amount, **key: type)**
NOTES **(key: name, ss#)**
AGENCY_EMPLOYEE **(key: name, ss#)**
KIDS **(key: name, ss#)**
SPOUSE **(key: name, ss#)**
REFERRED_BY **(key: name, ss#)**
(PERSON) HAS **(key: name, ss#)**
HAS_A (name, ss#, **key: policy_number)**
(POLICY_RECORD) UPDATES (policy_number, **key: cal_date, cal_topic)**
(POLICY_RECORD) HAS **(key: policy_number)**
(APS_FORM UPDATES **(key: policy_number, cal_date, cal_topic)**
COSTS (policy_number, **key: type)**
(PERSON) HAS (APPOINTMENT) **(key: name, ss#)**
(APPOINTMENTS) UPDATES **(key: name, ss#, cal_date, cal_topic)**
ENJOYS **(key: name, ss#)**
OWES (name, ss#, **key: type)**
EARNS **(key: name ss#)**
BECOMES **(key: name, ss#, category, date)**
OWNS (name, ss#, **key: type)**

FIGURE 3.10

HAVE (**key: type**)
WORKS_FOR (**key: name, ss#**)
TIME_TO_SEE (day, place, **key: name, ss#, time**)
OTHERS_INSURED (amt_of ins, relationship, **key: policy_#, name**)
(POLICY_RECORD) HAS_A (name, **key: policy_#**)
IS_A_GOOD (name ss#, **key: time**)
SPENDS (name ss#, **key: date**)

FIGURE 3.10 (CONT.)

RELATIONAL DATABASE MODEL
DESIGN 4

CLIENT (s_ins_amt_coverage,s_birthday, ct_address, ct_phone_no, ct_occupation, ct_wk_address, ct_wk_phone, ct_birthday, ref_made_by, ref_phone_no, misc, income, other_info, agent_name, out_of_town_sale, sale_date, ct_appt_time, cont_date, cont_results, **key: client_name, spouse_name**)

PROCTOWN (ct_name, issue_date, amount, prem_mode, prem_due, issue_age, yearly_prem, riders, pr_apl, pr_divid, loan_amt, loan_int, cash_val_last, cash_val_cur, cash_at_age_65, pri_bene, ben_cont, doc_form_rec, doc_call_date, aps_not_rec, aps_rec_date, **key: company_pro, policy_no**)

CHILDREN (ct_name, chins_amt_coverage, ch_birthy, **key: child_name**)

PRODAGSL (agent_comm, gen_ag_comm, pro_stat, company_pro, **key: agency_pro_name**)

SOLDTOCT (**key: company_pro, policy_no, agency_pro_name**)

INCACCT (debit_#, inc_amt, agency_pro_name, **key: inc_date, res_for_inc**)

DAILYADR (action, **key: completion, date, ct_name**)

ADRNEED (**key: date, ct_name, client_name, **)

AGENCY (general_agent, **key: agency_name**)

EXPACCT (exp_date, agn_name, exp_desc, exp_cat_name, exp_cat, exp_amt, **key: po_number**)

FIGURE 3.11

RELATIONAL DATABASE MODEL
DESIGN 5

AGENT (license, **key: agent_name**)
CLIENT (occupation, work_phone, spouse, home_phone, salary, home_addr, birthday, work_addr, **key: name**)
POLICY (policy_cash_value, policy_contigent_benficiary, policy_dividend, policy_loan_amt, policy_loan_int, policy_rider, replacement_policy_flag, primary_beneficial, plan, mode, date_issued, company, amount, **key: policy_number**)
PRODUCTS (company_name, **key: type**)
REMINDER_SYSTEM (appointment, call_date, annual_review, **key: date, agent_name**)
AGENCY_FINANCIAL_DATA (agent_commission,individual_income_amount, company_expense_amount, company_income_amount, expense_description, individual_expense_amount, **key: date, agent_name**)
CHILD (child_name, **key: client_name**)

FIGURE 3.12

RELATIONAL DATABASE MODEL
DESIGN 6

POLICY (p_apl, p_ctgnt_bnfcry, p_prime_bnfcry, p_cash_value, p_div_opt, p_face_amount, p_insrd_inits, p_loan_rate, p_riders, co_company, co_product, c_client, cl_prem_amt_due, cl_prem_amt_rcvd, cl_prem_date_due, cl_prem_date_rcvd, cl_prem_mode, **key: p_policy_no**)
COMPANY_PRODUCT (co_ovride_pct, co_percent, **key: co_company, co_product**)
CLIENT (cl_activity, cl_address, cl_birthday, cl_firm_address, cl_home_phone, cl_income, cl_insurance, cl_occupation, cl_other, cl_referred_by, cl_referred_phone, cl_spouse_bday, cl_time_to_see, cl_work_phone, e_name, **key: cl_spouse, cl_client**)
EXPENSE (ex_amount, e_name, **key: ex_date, ex_reason**)
CHILD (cl_child_bday, cl_child_insur, cl_client, cl_spouse, **key: cl_child**)
LICENSE (**key: co_product, e_name**)
CALL (cl_results, cl_client, cl_spouse, **key: cl_call_date, cl_need**)
EMPLOYEE (**key: e_name**)
PRODUCT (**key: co_product**)
COMPANY (**key: co_company**)

FIGURE 3.13

RELATIONAL DATABASE MODEL
DESIGN 7

GENERAL_AGENT (address, ss#, license_code, pay_rate, commission, **key: name**)
OFFICE_MANAGER (address, ss#, phone_#, pay_rate, **key: name**)
OFFICE_STAFF (address, ss#, phone_#, pay_rate, **key: name**)
REPORT_FILE (**key: o_s_name, reports_type**)
REPORTS (date, **key: type**)
SUBAGENTS (address, ss#, license_code, pay_rate, commission, **key: name**)
USER (**key: subagents_name, reports_type**)
LICENSED_AGENT (**key: subagents_name, product_type**)
PRODUCT (price, **key: type**)
COMPANY-REPRESENTATIVE (**key: product_type, company_name**)
COMPANY (address, phone_#, **key: name**)
SELLING_AGENT (**key: subagents_name, client_name**)
CLIENT (ss#, phone_#, birthdate, policy_types, policy_#, **key: name, address**)
SPOUSE (ss#, birthdate, policy_types, policy_#, **key: name**)
CHILD (ss#, birthdate, policy_types, policy_#, **key: name**)

FIGURE 3.14

DESIGN	# OF ENTITIES	# OF RELATIONSHIPS	ADEQUATE DATA	ADEQUATE ENTITIES AND RELATIONSHIPS	E-R MATCHES RELATIONAL SCHEMA
1	13	23	YES	YES	A few attributes are different
2	9	10	NO	NO Can not do many of the required reports	Some attributes differ
3	17	23	YES	YES (Possibly too many)	YES
4	9	8	YES	YES	NO Several attributes on the relational are not on the E-R
5	7	7	A few fields are missing	YES	Some attributes differ
6	9	9	A few fields are missing	NO Needs an entity to handle income	Some attributes are different
7	10	10	NO	NO Reminder system could not be handled	NO Several entities are different

FIGURE 3.15

Chapter 4: Implementation

In this chapter, the implementation of the two application programs will be discussed. The original application problems will be stated as well as the criteria used in writing the application programs. Changes to the existing database designs in order to implement the programs will be mentioned.

The purpose of this paper is to determine whether differences in database designs have an affect on the environment they are used in. To determine this, two application problems were chosen to represent on-line (interactive) characteristics of a database and batch related processing. Many other application problems could have been used, however, these were chosen as representative samples.

The first problem used to illustrate an interactive query was to produce a report that would give all the products (which includes insurance, IRA's, and annuities) that a client owns and the name of the agent that sold the products to the client. The second problem has characteristics of a summary report, thus, illustrating batch processing. In the second application, a report will be produced that gives the dollar value of all products sold by an agent during a specified time period. Subtotals of each line of business (insurance, IRA's, and annuities) is also provided.

One of the methods used in this paper to determine if a database design had an effect on the environment it was used in was to implement the same application problem in all seven designs and see if there were noticeable differences in the number of lines of code used in writing the programs. Since the goal here is to minimize the number of lines of code it was necessary to have some criteria as a guideline in writing the programs. The criteria used and assumptions to reduce coding are listed below:

1) Formatting of the reports was regarded as non-essential since more lines of code would be necessary to produce this.

2) There is no editing on data that is asked for as input. It is assumed that the user will enter everything correctly. This, of course, is not a situation one would want to have in a business environment for obvious reasons.

3) A minimum number of configuration commands were used (e.g., SET TALK OFF).

Essentially only those lines of code that were absolutely necessary to produce the required information without regard to formatting or editing were used.

Another goal in implementing the application problems was to try to maintain the continuity of the seven database designs. Some changes in the design were necessary in order to implement the two application programs. In most cases, the modifications were minor. New attributes may have had to have been added to some database files. Some of the attributes in a *file* structure may have been changed (e.g., field length from 9 to 10).

As noted in chapter three, some of the schemas are better suited to handle certain situations than others, in particular, the different product lines. In order to work with the different kinds of products, several of the schemas had to be modified. To minimize the degree of restructuring the designs, new attributes were added to the existing files to handle the various products. One would probably not want to do this in a practical situation because life insurance, IRA's and annuities are considerably different in the types of data needed to maintain them. For the purposes here, though, it served to maintain continuity of a design before and after the implementation took place.

The individual modifications to each design will now be discussed. In design one an attribute *ins:type* was changed to *prodct:nam* in order to make it consistent with the attributes used in the entities *annuity* and *ira* (see Figure 4.1). This made it easer to use the APPEND command in implementing the first program. *Prod:type* was added to the entity *sales* to produce the second report. There is a limitation on tracing a sale back to a particular client because there is not a client name field in *sales.*

Design two was not set up to effectively work with IRA's and annuities so the *plan* attribute in *policyrc* was used to include those types of products. An attribute, *type*, was introduced in *policyrc* to distinguish the different product lines. The values used were INS for insurance products, ANN for annuity products and IAA for IAA's. The attribute *face amt*, numeric width type, was increased from 8,2 to 9,2 to handle policies that are $100,000 and above. *Agentname* was added to *polyrc* to link a policy with the agent who sold it (see Figure 4.2)

In design three, it was necessary to add several attributes to the *policy* entity. These included *type*, *agent* and *plan*. The data used in these attributes are similar to those used in design two. *Type* distinguishes the different product lines with the values being LIFE, IAA and ANN (see Figure 4.3).

Design four had only one change. The attribute *prodtype* was added to the entity *proctown* to distinguish the product lines on a particular policy (see Figure 4.4).

Design five needed only one change also. Again, the reason for the modification was to be able to work with different products so the field *poltype* was added to the entity *policy* (see Figure 4.5).

Design six needed an attribute in order to produce the second report so *date:sold* was added to *policy*. This field is used to store the date a particular product is sold. One might note that the entity *client* also has an attribute called *client* which could become confusing when writing programs using this file (see Figure 4.6)

Design seven needed several minor changes for implementation. *Pname* was added to *client_p* to store the different types of product plans (e.g. Whole Life). *Ptype's* structure was changed from numeric 2 to character 2 in order to produce more meaningful results for the second application problem. *Ptype's* values are IA for IAA, LF for life products and AN for annuity products. *Pamt's* width was changed from a numeric 8,2 to 9,2 to handle the larger dollar value policies (see Figure 4.7)

The data used was the same in all seven designs, however, depending on the design, some attributes may be used in one case and disregarded in another. For example, one design may link a policy to an agent by policy number while another design may use a client ID number. Each database was established with fifteen records in them representing separate policies. By having the same number of records in the files, the execution times will be more standardized. To look at the data used in the individual databases, see Figures 4.8-4.14. Only the attributes that were used in the programs are shown.

To execute the programs simply type DO *program name* (e.g. Do DESIGN1A). The first application will prompt one to enter a client's name. The second application requires one to enter an agent's name and the starting and ending date which are used as a time frame to do a search on to retrieve all the products sold by an agent during the specified time period.

In the next chapter, the application programs will be compared showing both the differences in the number of lines of code necessary for implementation and the execution times of each.

DESIGN 1

STRUCTURE FOR FILE: A:CLIENT .DBF
NUMBER OF RECDRDS: 00010
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	CLIENT:ID	N	005	
002	CLIENT:NAM	C	030	
003	CLIENT:ADD	C	030	
004	CLIENT:PH	N	010	
005	CLIENT:DCC	C	030	
006	CL:EMP:ADD	C	030	
007	CL:BUS:PH	N	010	
008	CL:REF:NAM	C	030	
009	CLIENT:INC	N	009	002
** TDTAL **			00185	

STRUCTURE FDR FILE: A:INSPDLCY.DBF
NUMBER OF RECDRDS: 00010
DATE OF LAST UPDATE: 03/28/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	CLIENT:ID	N	005	
002	EMP:ID	N	003	
003	CO:NAME	C	030	
004	IN:PLCY:NO	N	010	
005	INS:AMOUNT	N	009	002
006	PRODCT:NAM	C	030	
007	POLCY:DATE	N	006	
008	POLCY:PRE	N	008	002
009	WP:RIDER	C	001	
010	ADB:RIDER	C	001	
011	GIA:RIDER	C	001	
012	CPB:RIDER	C	001	
013	DIV:OPTION	C	001	
014	PDL:LN:AMT	N	009	002
015	POL:LN:RT	N	004	002
016	GUAR:VALUE	N	009	002
017	TDT:VALUE	N	009	002
018	PRIM:BENIF	C	030	
019	CNTG:BENIF	C	030	
** TDTAL **			00198	

FIGURE 4.1

DESIGN 1

```
.
STRUCTURE FOR FILE:   A:ANNUITY .DBF
NUMBER OF RECORDS:    00010
DATE OF LAST UPDATE: 09/13/86
PRIMARY USE DATABASE
FLD        NAME       TYPE WIDTH   DEC
001       CLIENT:ID     N     005
002       EMP:ID        N     003
003       CO:NAME       C     030
004       PRODCT:NAM    C     010
005       ANN:ACT:NO    N     005
006       ANN:DATE      N     006
007       ANN:AMT       N     009     002
** TOTAL **               00069

.
STRUCTURE FOR FILE:   A:IRA     .DBF
NUMBER OF RECORDS:    00010
DATE OF LAST UPDATE: 03/06/86
PRIMARY USE DATABASE
FLD        NAME       TYPE WIDTH   DEC
001       CLIENT:ID     N     005
002       EMP:ID        N     003
003       CO:NAME       C     030
004       PRODCT:NAM    C     030
005       IRA:ACT:NO    N     010
006       IRA:DATE      N     006
007       IRA:AMT       N     009     002
** TOTAL **               00094

.
STRUCTURE FOR FILE:   A:EMPLOYEE.DBF
NUMBER OF RECORDS:    00003
DATE OF LAST UPDATE: 04/05/87
PRIMARY USE DATABASE
FLD        NAME       TYPE WIDTH   DEC
001       EMP:ID        N     003
002       EMP:NAME      C     030
003       EMP:ADDRES    C     030
004       JOB:TITLE     C     020
** TOTAL **               00084

.
STRUCTURE FOR FILE:   A:SALES   .DBF
NUMBER OF RECORDS:    00015
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE
FLD        NAME       TYPE WIDTH   DEC
001       EMP:ID        N     003
002       CO:NAME       C     030
003       PRDO:TYPE     C     015
004       PRDO:NAME     C     030
005       SALES:AMT     N     009     002
006       SALE:DATE     N     006
007       COMM:SOLD     N     007     002
008       NO:OF:SAL     N     003
** TOTAL **               00104
```

FIGURE 4.1 (CONT.)

DESIGN 2

A>
STRUCTURE FOR FILE: A:POLICYRC.DBF
NUMBER OF RECORDS: 00030
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	CONAME	C	026	
002	COADDRESS	C	042	
003	CLIENTNAME	C	026	
004	AGENTNAME	C	026	
005	TYPE	C	003	
006	PLAN	C	030	
007	PREMIUM	N	008	002
008	APL	N	001	
009	RIDERS	C	003	
010	AGEINSURD	N	003	
011	DATEISSUE	N	008	
012	FACEAMT	N	009	002
013	INSURINIT	C	003	
014	INSURNAME	C	026	
015	POLICYNUMB	N	012	
016	PREMIUMDUE	N	008	
017	MODE	C	009	
018	CONTBENIF	C	026	
019	PRIMBENIF	C	026	
020	CASHVALUE	N	008	002
021	LINTRATE	N	002	
022	LOANAMT	N	008	002
023	LOAN	N	001	
024	DIVOPT	N	001	
025	GROSYRPREM	N	008	002
** TOTAL **			00324	

FIGURE 4.2

DESIGN 3

```
STRUCTURE FOR FILE:  A:PDLICY  .DBF
NUMBER DF RECDRDS:   00030
DATE DF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE
FLD       NAME       TYPE WIDTH   DEC
001     PDLICY:ND     C    009
002     AGENT         C    025
003     CD:NAME       C    020
004     EXP:DATE      C    006
005     REP:DATE      C    006
006     AMT:DF:INS    N    007
007     APL           C    001
008     NAME          C    020
009     SS            C    009
010     DATE:SOLD     C    006
011     TYPE          C    004
012     PLAN          C    025
013     DIV:DPT       C    001
014     LDAN:AMT      N    007
015     LDAN:RATE     N    010
016     PRI:BEN       C    020
017     CONTIN:BEN    C    020
** TDTAL **              00197
```

FIGURE 4.3

DESIGN 4

STRUCTURE FOR FILE: A:PROCTOWN.OBF
NUMBER OF RECORDS: 00015
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLO	NAME	TYPE	WIDTH	DEC
001	PRDOTYPE	C	004	
002	CDMPPROV	C	020	
003	PDLICYND	N	007	
004	CTNAME	C	020	
005	ISSUOATE	N	006	
006	AMDUNT	N	007	
007	PREMMOOE	C	004	
008	PREMOUE	N	007	002
009	ISSUAGE	N	002	
010	YEARPREM	N	007	
011	RIDERS	C	004	
012	PRAPL	C	003	
013	PREMDIV	N	004	
014	LOANAMT	N	008	002
015	LOANINT	N	003	002
016	CASHVLAS	N	007	
017	CASHVCUR	N	007	
018	CVLYRGAR	N	007	
019	CVCYRGAR	N	007	
020	CASHVG65	N	007	
021	CASHV65	N	007	
022	PRIMBENE	C	020	
023	SECBENE	C	020	
024	OOCFORMR	C	001	
025	ODCCALLD	N	006	
026	APSNDRRE	C	001	
027	APSROATE	N	006	
** TDTAL **			00203	

STRUCTURE FOR FILE: A:AGTCTS .OBF
NUMBER OF RECDRDS: 00010
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	AGNNAME	C	020	
002	CTNAME	C	020	
** TOTAL **			00041	

FIGURE 4.4

DESIGN 5

STRUCTURE FOR FILE: A:CLIENT .DBF
NUMBER OF RECORDS: 00015
DATE OF LAST UPDATE: 04/20/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	CLTNAME	C	025	
002	CLTHOME	N	007	
003	CLTINSUR	N	007	
004	CLTDREAL	N	007	
005	CLTPERSL	N	007	
006	CLTSALRY	N	006	
007	CLTTCASH	N	007	
008	CLTCNAME	C	025	
009	CLTFADDR	C	040	
010	CLTHADDR	C	040	
011	CLTOCCUP	C	020	
012	CLTWNAME	C	025	
013	CLTWKPHO	N	010	
014	CLTPOLNO	N	010	
015	CLTPPOLQ	N	001	
** TOTAL **			00238	

STRUCTURE FOR FILE: A:AGENT .DBF
NUMBER OF RECORDS: 00010
DATE OF LAST UPDATE: 04/05/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	AGTNAME	C	025	
002	AGTTYPE	C	001	
003	AGTLIC	C	010	
004	AGTCOMM	N	008	
005	AGTCNAME	C	025	
** TOTAL **			00070	

STRUCTURE FOR FILE: A:POLICY .DBF
NUMBER OF RECORDS: 00015
DATE OF LAST UPDATE: 04/05/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	POLNO	N	010	
002	POLAMONT	N	008	
003	POLAMT	N	004	
004	POLCMPNY	C	015	
005	POLDATE	N	006	
006	POLMODE	C	002	
007	POLTYPE	C	004	
008	POLPLAN	C	030	
009	POLVALUE	N	007	
010	POLCBEN	C	025	
011	POLPBEN	C	025	
012	POLRFLAG	N	001	
** TOTAL **			00138	

FIGURE 4.5

DESIGN 6

.

STRUCTURE FDR FILE: A:CLIENT .DBF
NUMBER OF RECORDS: 00010
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	CLIENT	C	020	
002	SPOUSE	C	025	
003	ACTIVITY	C	025	
004	ADDRESS	C	025	
005	BIRTHDAY	C	008	
006	F:ADDRESS	C	025	
007	H:PHONE	C	010	
008	INCOME	N	010	002
009	INSURANCE	C	020	
010	OCCUPATION	C	025	
011	OTHER	C	025	
012	REFERED:BY	C	025	
013	S:BIRTHDAY	C	008	
014	TIME:TO:SE	C	020	
015	W:PHONE	C	010	
016	ENAME	C	020	
** TOTAL **			00302	

.

STRUCTURE FOR FILE: A:POLICY .DBF
NUMBER OF RECORDS: 00015
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	POLICYNO	C	020	
002	CLIENT	C	020	
003	COMPANY	C	020	
004	PRODTYPE	C	004	
005	PRODUCT	C	020	
006	APL	C	001	
007	P:BENEFIC	C	025	
008	CASH:VAL	N	010	002
009	DIV:OPT	C	001	
010	DATE:SOLD	N	006	
011	FACE:AMT	N	010	002
012	INSRD:INIT	C	003	
013	LOAN:RATE	N	005	002
014	RIDERS	C	020	
015	PREM:AMTDU	N	010	002
016	PREM:AMTRC	N	010	002
017	PREMDATEDU	C	008	
018	PREMDATERC	C	008	
019	PREMMODE	C	002	
** TOTAL **			00204	

FIGURE 4.6

DESIGN 7

```
.
STRUCTURE FOR FILE:  A:CLIENT_P.DBF
NUMBER OF RECORDS:   00015
DATE OF LAST UPDATE: 04/09/87
PRIMARY USE DATABASE
FLD       NAME      TYPE WIDTH   DEC
001      CLNAME       C    018
002      CONAME       C    030
003      DATEISS      C    006
004      PTYPE        C    002
005      PNAME        C    023
006      PAMT         N    009    002
007      PNUM         C    020
008      BENNAME      C    042
009      PREMMODE     C    002
010      PREMAMT      N    008    002
011      PREMDUE      N    008    002
012      SELNAME      C    020
** TOTAL **              00189
```

FIGURE 4.7

DESIGN 1 DATA

CLIENT

CLIENT:ID	CLIENT:NAM
10001	Baliard, Joe
40001	Gould, Pat
30003	Evans, Bob
30013	Sanford, William
50251	Simpson, Charlotte
90005	Bond, Steve
42055	Wells, Charles
30889	Seeker, Jan
9841	Tiffany, Susan
57896	Oxford, Dan

INSPOLCY

CLIENT:ID	EMP:ID	PRODCT:NAM
40001	111	Whole Life
57896	202	10 Pay Term
40404	284	Universal Life
52201	111	10 Pay Whole Life
30889	284	Single Premium Life
66844	202	Universal Life
99965	111	Discoverer Life
42055	111	10 Year Paid Life
50251	284	Term
22992	284	Paid Up Life

ANNUITY

CLIENT:ID	EMP:ID	PRODCT:NAM
40001	111	FPA
44875	202	SPA
48876	284	FPA
9841	202	FPA
54912	202	SPA
30013	111	FPA
48600	111	SPA
90005	202	FPA
42055	202	SPA
34001	202	FPA

IRA

CLIENT:ID	EMP:ID	PRODCT:NAM
57575	111	Fidelity Magellan
90005	202	Money Market
57896	284	Putnam High Yield
22225	284	Mutual Funds
33386	284	High Yield Trust
10001	111	Fidelity Overseas
30003	202	Ginnie Mae
57896	202	Vista
49612	202	Bonds
50891	284	Trust Fund

EMPLOYEE

EMP:ID	EMP:NAME
111	Reed, Richard
284	Thompson, Sharon
202	Doe, Ronald

FIGURE 4.8

DESIGN 1 DATA

EMP:ID	PROD:TYPE	PROD:NAME	SALES:AMT	SALE:DATE
111	Insurance	Whole Life	20000.00	860111
202	Insurance	10 Pay Term	50000.00	860105
111	Annuity	FPA	1000.00	860325
202	IRA	Vista	2000.00	861225
202	Annuity	SPA	4000.00	861005
284	Insurance	Term	100000.00	860125
111	Annuity	FPA	2000.00	860125
111	IRA	Fidelity Overseas	10000.00	860110
284	IRA	Putnam High Yield	5000.00	860918
284	Insurance	Single Premium Life	25000.00	860707
202	Annuity	FPA	10000.00	860515
202	IRA	Ginnie Mae	1000.00	860715
111	Insurance	10 Year Paid Life	50000.00	860131
202	Annuity	FPA	5000.00	860115
202	IRA	Money Market	2000.00	860201

SALES

FIGURE 4.8 (CONT.)

DESIGN 2 DATA

CLIENTNAME	DATEISSUE	FACEAMT	AGENTNAME	TYPE	PLAN
Ballard, Joe	860110	10000.00	Reed, Richard	IRA	Fidelity Overseas
Gould, Pat	860111	20000.00	Reed, Richard	INS	Whole Life
Gould, Pat	860325	1000.00	Reed, Richard	ANN	FPA
Evans, Bob	860715	1000.00	Doe, Ronald	IRA	Ginnie Mae
Sanford, William	860125	2000.00	Reed, Richard	ANN	FPA
Simpson, Charlotte	860125	100000.00	Thompson, Sharon	INS	Term
Bond, Steve	860201	2000.00	Doe, Ronald	IRA	Money Market
Bond, Steve	860115	5000.00	Doe, Ronald	ANN	FPA
Wells, Charles	860131	50000.00	Reed, Richard	INS	10 Year Paid Life
Wells, Charles	861005	4000.00	Reed, Richard	ANN	SPA
Seeker, Jan	860707	25000.00	Thompson, Sharon	INS	Single Premium Life
Tiffany, Susan	860515	10000.00	Doe, Ronald	ANN	FPA
Oxford, Dan	860105	50000.00	Doe, Ronald	INS	10 Pay Term
Oxford, Dan	860918	5000.00	Thompson, Sharon	IRA	Putnam High Yield
Oxford, Dan	861225	2000.00	Doe, Ronald	IRA	Vista

POLICYRC

FIGURE 4.9

DESIGN 3 DATA

AGENT	AMT:OF:INS	NAME	DATE:SOLD	TYPE	PLAN
Reed, Richard	10000	Ballard, Joe	011086	IRA	Fidelity Ove rseas
Reed, Richard	20000	Gould, Pat	011186	LIFE	Whole Life
Doe, Ronald	2000	Oxford, Dan	122586	IRA	Vista
Doe, Ronald	5000	Bond, Steve	011586	ANN	FPA
Doe, Ronald	10000	Tiffany, Susan	051586	ANN	FPA
Doe, Ronald	1000	Evans, Bob	071586	IRA	Ginnie Mae
Doe, Ronald	50000	Oxford, Dan	010586	LIFE	10 Pay Term
Thompson, Sharon	100000	Simpson, Charlotte	012586	LIFE	Term
Reed, Richard	4000	Wells, Charles	100586	ANN	SPA
Reed, Richard	1000	Gould, Pat	032586	ANN	FPA
Thompson, Sharon	5000	Oxford, Dan	091886	IRA	Putnam High Yield Trust
Reed, Richard	2000	Sanford, William	012586	ANN	FPA
Doe, Ronald	2000	Bond, Steve	020186	IRA	Money Market
Thompson, Sharon	25000	Seeker, Jan	070786	LIFE	Single Premi um Life
Reed, Richard	50000	Wells, Charles	013186	LIFE	10 Year Paid Life

POLICY

FIGURE 4.10

DESIGN 4 DATA

AGNNAME	CTNAME
Reed, Richard	Ballard, Joe
Thompson, Sharon	Simpson, Charlotte
Doe, Ronald	Tiffany, Susan
Doe, Ronald	Oxford, Dan
Reed, Richard	Wells, Charles
Reed, Richard	Gould, Pat
Thompson, Sharon	Seeker, Jan
Doe, Ronald	Evans, Bob
Doe, Ronald	Bond, Steve
Reed, Richard	Sanford, William

AGTCTS

PRODTYPE	COMPPROV	CTNAME	ISSUDATE	AMOUNT
IRA	Fidelity Overseas	Ballard, Joe	860110	10000
IRA	Vista	Oxford, Dan	861225	2000
LIFE	10 Year Paid Life	Wells, Charles	860131	50000
IRA	Ginnie Mae	Evans, Bob	860715	1000
IRA	Money Market	Bond, Steve	860201	2000
LIFE	Single Premium Life	Seeker, Jan	860707	25000
LIFE	Whole Life	Gould, Pat	860111	20000
LIFE	10 Pay Term	Oxford, Dan	860105	50000
ANN	FPA	Tiffany, Susan	860515	10000
ANN	FPA	Sanford, William	860125	2000
ANN	SPA	Wells, Charles	861005	4000
ANN	FPA	Bond, Steve	860115	5000
LIFE	Term	Simpson, Charlotte	860125	100000
IRA	Putnam High Yield	Oxford, Dan	860918	5000
ANN	FPA	Gould, Pat	860325	1000

PROCTOWN

FIGURE 4.11

DESIGN 5 DATA

CLIENT

CLTNAME	CLTPOLNO
Ballard, Joe	785940
Oxford, Dan	100785
Wells, Charles	200784
Evans, Bob	865434
Bond, Steve	568693
Seeker, Jan	14761
Gould, Pat	922264
Oxford, Dan	215900
Tiffany, Susan	697823
Sanford, William	533974
Wells, Charles	863460
Bond, Steve	842669
Simpson, Charlotte	699380
Oxford, Dan	384917
Gould, Pat	769155

AGENT

AGTNAME	AGTCNAME
Reed, Richard	Ballard, Joe
Thompson, Sharon	Simpson, Charlotte
Doe, Ronald	Tiffany, Susan
Doe, Ronald	Oxford, Dan
Reed, Richard	Wells, Charles
Reed, Richard	Gould, Pat
Thompson, Sharon	Seeker, Jan
Doe, Ronald	Evans, Bob
Doe, Ronald	Bond, Steve
Reed, Richard	Sanford, William

POLICY

POLNO	POLTYPE	POLPLAN	POLDATE	POLAMONT
785940	IRA	Fidelity Overseas	860110	10000
100785	IRA	Vista	861225	2000
200784	LIFE	10 Year Paid Life	860131	50000
865434	IRA	Ginnie Mae	860715	1000
568693	IRA	Money Market	860201	2000
14761	LIFE	Single Premium Life	860707	25000
922264	LIFE	Whole Life	860111	20000
215900	LIFE	10 Pay Term	860105	50000
697823	ANN	FPA	860515	10000
533974	ANN	FPA	860125	2000
863460	ANN	SPA	861005	4000
842669	ANN	FPA	860115	5000
699380	LIFE	Term	860125	100000
384917	IRA	Putnam High Yield	860918	5000
769155	ANN	FPA	860325	1000

FIGURE 4.12

DESIGN 6 DATA

CLIENT

CLIENT	ENAME
Ballard, Joe	Reed, Richard
Simpson, Charlotte	Thompson, Sharon
Tiffany, Susan	Doe, Ronald
Oxford, Dan	Doe, Ronald
Wells, Charles	Reed, Richard
Gould, Pat	Reed, Richard
Seeker, Jan	Thompson, Sharon
Evans, Bob	Doe, Ronald
Bond, Steve	Doe, Ronald
Sanford, William	Reed, Richard

POLICY

CLIENT	PRODTYPE	PRODUCT	DATE:SOLD	FACE:AMT
Ballard, Joe	IRA	Fidelity Overseas	860110	10000.00
Oxford, Dan	IRA	Vista	861225	2000.00
Wells, Charles	LIFE	10 Year Paid Life	860131	50000.00
Evans, Bob	IRA	Ginnie Mae	860715	1000.00
Bond, Steve	IRA	Money Market	860201	2000.00
Seeker, Jan	LIFE	Single Premium Life	860707	25000.00
Gould, Pat	LIFE	Whole Life	860111	20000.00
Oxford, Dan	LIFE	10 Pay Term	860105	50000.00
Tiffany, Susan	ANN	FPA	860515	10000.00
Sanford, William	ANN	FPA	860125	2000.00
Wells, Charles	ANN	SPA	861005	4000.00
Bond, Steve	ANN	FPA	860115	5000.00
Simpson, Charlotte	LIFE	Term	860125	100000.00
Oxford, Dan	IRA	Putnam High Yield	860918	5000.00
Gould, Pat	ANN	FPA	860325	1000.00

FIGURE 4.13

DESIGN 7 DATA

CLNAME	DATEISS	PTYPE	PNAME	PAMT	SELNAME
Ballard, Joe	860110	IR	Fidelity Overseas	10000.00	Reed, Richard
Gould, Pat	860111	LF	Whole Life	20000.00	Reed, Richard
Oxford, Dan	861225	IR	Vista	2000.00	Doe, Ronald
Bond, Steve	860115	AN	FPA	5000.00	Doe, Ronald
Tiffany, Susan	860515	AN	FPA	10000.00	Doe, Ronald
Evans, Bob	860715	IR	Ginnie Mae	1000.00	Doe, Ronald
Oxford, Dan	860105	LF	10 Pay Term	50000.00	Doe, Ronald
Simpson, Charlotte	860125	LF	Term	100000.00	Thompson, Sharon
Wells, Charles	861005	AN	SPA	4000.00	Reed, Richard
Gould, Pat	860325	AN	FPA	1000.00	Reed, Richard
Oxford, Dan	860918	IR	Putnam High Yield Trust	5000.00	Thompson, Sharon
Sanford, William	860125	AN	FPA	2000.00	Reed, Richard
Bond, Steve	860201	IR	Money Market	2000.00	Doe, Ronald
Seeker, Jan	860707	LF	Single Premium Life	25000.00	Thompson, Sharon
Wells, Charles	860131	LF	10 Year Paid Life	50000.00	Reed, Richard

CLIENT_P

FIGURE 4.14

CHAPTER 5: Application Program Analysis

In this chapter, a comparison of the application programs is made. The two criteria used in the analysis is the total lines of code used and the execution time for each.

Since these programs do not have any editing in them it is important to know that the user is assumed to enter the data correctly. Should the user input invalid data (wrong data, or clients that are not on the file), in some cases, a report will still be generated giving the appearance that the input was valid. DBase II makes a distinction between upper and lower case letters so if a name is entered in lower case while it is stored in upper and lower case, it will be as if the name can not be found on the file.

To measure the execution time, each application was run three times using a stopwatch, with hundredths of a second accuracy, to do the timing. In the first application program the timed portion was from the moment the enter key was hit after the input was entered to the time the report was finished. In the second application program, the timed portion was from the moment the enter key was struck after the input was entered to the time the report started printing. The reason for timing to the beginning of the report being printed was because the report tended to be longer so in order to print it, the computer may have had to make several disk accesses which slowed down overall execution time considerably. After the three timings for each application was completed their average was calculated.

Figures 5.1.1 through 5.7.3 are the individual programs, the report form layouts, and sample output from each application. Figure 5.8 gives a summary of the number of lines of code used for each program and the execution times for each application.

In looking at the first application program which returns all the policies a client owns and the agent who sold the policies, designs two, three, and seven have the least lines of code. Only one file needed to be accessed in each case to obtain the necessary data to produce the report required.

Design one having 13 entities and 23 relationships required the most lines of code (21) even though the schema is probably the best in handling the different product lines. It is easily seen that the more files that are accessed, causes an increase in the coding, due to the creation of temporary files through the use of JOIN and COPY commands.

Design four has 9 entities and 8 relationships and is similar to design two which has 9 entities and 10 relationships but only two files needed to be accessed from the database rather then the five that were accessed in design one. This meant fewer lines of code were necessary to implement design four.

Design five (7 entities and 7 relationships)and design six (9 entities and 9 relationships) resemble each other in that when executed, the agent's name who sold the products to the client will appear first and then the products the client owns. Because there is nothing which links an agent to the policy, in both cases it has to be assumed that all the client's products are sold by the same agent.

In the second application program which gives all the products sold by an agent in the specific time period, design five has the most lines of code (23). This is due to the additional traversing that had to be done in order to link the policy number to a client.

Design six's code was almost identical to design five's but one less file had to be accessed because a client's name could directly be linked to a policy. This decreased the number of lines of code necessary to implement the second application.

Design four required the same number of lines of code as design six (19). The schemas are closely related to each other so this could be expected.

Designs two, three, and seven again required the least coding. This is due to the fact that only one file had to be accessed to retrieve the necessary information to produce the report.

Reviewing the execution times for each application reveals that for the on-line applications, the number of lines of code and the types of commands used plays an important role in the overall run time. Design one which has the most file accesses and uses the most COPY and APPEND commands has run times which double and nearly triple most of the others. It is surprising to note that the batch application for design one runs considerably faster than all the designs except seven.

During the analysis of the second application program written for design six, it was necessary to rewrite it since the same thing could be accomplished using one less file access. This helped decrease the execution time by approximately 18%.

It appears that a determining factor in the length of coding as well as the execution times is how many files have to be accessed to retrieve the necessary data. The number of entities and relationships a design has is not as important as how the attributes are arranged with the entities and relationships in making up the overall design. This can be shown by looking at designs one and three. They have the most entities and relationships among the seven designs, however, design one used the most lines of code in the first application while design three used the least.

DESIGN 1

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use client
locate for client:nam = clnt
store client:id to clnt:id
use inspolcy
copy to temp1 field emp:id,prodct:nam for clnt:id = client:id
use annuity
copy to temp2 field emp:id,prodct:nam for clnt:id = client:id
use ira
copy to temp3 field emp:id,prodct:nam for clnt:id = client:id
use temp1
append from temp2
append from temp3
use temp1
select secondary
use employee
select primary
join to newfile for emp:id = s.emp:id field prodct:nam,emp:name
use newfile
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use employee
locate for emp:name = agentid
store emp:id to empfound
use sales
copy to temp1 for emp:id = empfound;
             .and. sale:date >= start:date;
             .and. sale:date <= end:date
use temp1
sort on prod:type to temp2
use temp2
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.1.1

DESIGN 1

REPORT FORM SALESAGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: prod:type
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL      WIDTH,CONTENTS
001      30,prod:name
ENTER HEADING: PRODUCT NAME
002      12,sales:amt
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
003
```

FIGURE 5.1.2

DESIGN 1

PROGRAM EXECUTIONS

```
. do design1a
Enter Client's Name (Last, First) :Gould, Pat
00001  Whole Life                     Reed, Richard
00002  FPA                            Reed, Richard
.

. do design1a
Enter Client's Name (Last, First) :Oxford, Dan
00001  10 Pay Term                    Doe, Ronald
00002  Putnam High Yield              Thompson, Sharon
00003  Vista                          Doe, Ronald
.

. do design1a
Enter Client's Name (Last, First) :Seeker, Jan
00001  Single Premium Life            Thompson, Sharon
.
```

```
           PRODUCT NAME              AMOUNT

 * TOTAL FOR PRODUCT TYPE:  Annuity
 FPA                                  2000.00
 ** SUBTOTAL **
                                      2000.00

 * TOTAL FOR PRODUCT TYPE:  IRA
 Fidelity Overseas                   10000.00
 ** SUBTOTAL **
                                     10000.00

 * TOTAL FOR PRODUCT TYPE:  Insurance
 Whole Life                          20000.00
 10 Year Paid Life                   50000.00
 ** SUBTOTAL **
                                     70000.00

 ** TOTAL **
                                     82000.00
```

FIGURE 5.1.3

DESIGN 2

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use policyrc
copy to templ field clientname,agentname,plan for clientname=clnt
use templ
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use policyrc
copy to templ for agentname = agentid;
              .and. dateissue )= start:date;
              .and. dateissue (= end:date
use templ
sort on type to temp2
use temp2
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.2.1

DESIGN 2

REPORT FORM SALESAGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: type
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL     WIDTH,CONTENTS
001      30,plan
ENTER HEADING: PLAN
002      12,faceamt
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.2.2

DESIGN 2

PROGRAM EXECUTIONS

```
. do design2a
Enter Client's Name (Last, First) :Gould, Pat
00001  Gould, Pat                 Reed, Richard            Whole Life

00002  Gould, Pat                 Reed, Richard            FPA

.


. do design2a
Enter Client's Name (Last, First) :Oxford, Dan
00001  Oxford, Dan                Doe, Ronald              10 Pay Term

00002  Oxford, Dan                Thompson, Sharon         Putnam High Yield

00003  Oxford, Dan                Doe, Ronald              Vista

.


. do design2a
Enter Client's Name (Last, First) :Seeker, Jan
00001  Seeker, Jan                Thompson, Sharon         Single Premium Life

.
```

```
                    SALES TOTALS BY PRODUCT TYPE


              PLAN                  AMOUNT

      * TOTAL FOR PRODUCT TYPE: ANN
      FPA                               2000.00
      ** SUBTOTAL **
                                        2000.00


      * TOTAL FOR PRODUCT TYPE: INS
      Whole Life                       20000.00
      10 Year Paid Life                50000.00
      ** SUBTOTAL **
                                       70000.00


      * TOTAL FOR PRODUCT TYPE: IRA
      Fidelity Overseas                10000.00
      ** SUBTOTAL **
                                       10000.00

      ** TOTAL **
                                       82000.00
```

FIGURE 5.2.3

DESIGN 3

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use policy
copy to templ field name,agent,type,plan for name=clnt
use templ
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use policy
copy to templ for agent = agentid;
              .and. val(date:sold) )= start:date;
              .and. val(date:sold) (= end:date
use templ
sort on type to temp2
use temp2
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.3.1

DESIGN 3

REPORT FORM SALESAGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: type
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL     WIDTH,CONTENTS
001     20,plan
ENTER HEADING: PLAN
002      9,amt:of:ins
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.3.2

DESIGN 3

PROGRAM EXECUTIONS

```
. do design3a
Enter Client's Name (Last, First) :Gould, Pat
00001   Gould, Pat          Reed, Richard          LIFE Whole Life

00002   Gould, Pat          Reed, Richard          ANN  FPA

.


. do design3a
Enter Client's Name (Last, First) :Oxford, Dan
00001   Oxford, Dan         Doe, Ronald            1RA  Vista

00002   Oxford, Dan         Doe, Ronald            LIFE 10 Pay Term

00003   Oxford, Dan         Thompson, Sharon       IRA  Putnam High Yield Tru
st
.


. do design3a
Enter Client's Name (Last, First) :Seeker, Jan
00001   Seeker, Jan         Thompson, Sharon       L1FE Single Premium Life

.


                         SALES TOTALS BY PRODUCT TYPE

              PLAN              AMOUNT

       * TOTAL FOR PRODUCT TYPE:  ANN
       FPA                       2000
       ** SUBTOTAL **
                                 2000


       * TOTAL FOR PRODUCT TYPE:  1RA
       Fidelity Overseas        10000
       ** SUBTOTAL **
                                10000


       * TOTAL FOR PRODUCT TYPE:  L1FE
       Whole Life               20000
       10 Year Paid Life        50000
       ** SUBTOTAL **
                                70000

       ** TOTAL **
                                82000
```

FIGURE 5.3.3

DESIGN 4

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use proctown
copy to temp1 field ctname,prodtype,compprov for ctname=clnt
use temp1
select secondary
use agtcts
select primary
join to newfile for ctname = s.ctname;
     field prodtype,compprov,agnname
use newfile
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use agtcts
copy to temp1 field ctname for agnname = agentid
use temp1
select secondary
use proctown
select primary
join to newfile for ctname = s.ctname;
     field prodtype,compprov,issudate,amount
use newfile
copy to temp2 for issudate >= start:date;
           .and. issudate <= end:date
use temp2
sort on prodtype to temp3
use temp3
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.4.1

DESIGN 4

REPORT FORM   SALESRGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: prodtype
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL      WIDTH,CONTENTS
001      20,compprov
ENTER HEADING: PLAN
002      10,amount
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.4.2

DESIGN 4

PROGRAM EXECUTIONS

```
. do design4a
Enter Client's Name (Last, First) :Gould, Pat
00001  LIFE Whole Life             Reed, Richard
00002  ANN  FPA                    Reed, Richard
.

. do design4a
Enter Client's Name (Last, First) :Oxford, Dan
00001  IRA  Vista                  Doe, Ronald
00002  LIFE 10 Pay Term            Doe, Ronald
00003  IRA  Putnam High Yield      Doe, Ronald
.

. do design4a
Enter Client's Name (Last, First) :Seeker, Jan
00001  LIFE Single Premium Life   Thompson, Sharon
.
```

```
                          SALES TOTALS BY PRODUCT TYPE

            PLAN              AMOUNT

     * TOTAL FOR PRODUCT TYPE:  ANN
     FPA                        2000
     ** SUBTOTAL **
                                2000

     * TOTAL FOR PRODUCT TYPE:  IRA
     Fidelity Overseas         10000
     ** SUBTOTAL **
                               10000

     * TOTAL FOR PRODUCT TYPE:  LIFE
     10 Year Paid Life         50000
     Whole Life                20000
     ** SUBTOTAL **
                               70000

     ** TOTAL **
                               82000
```

FIGURE 5.4.3

DESIGN 5

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use agent .
copy to templ field agtname for agtcname=clnt
use templ
list
use client
copy to temp2 field cltpolno for cltname=clnt
use temp2
select secondary
use policy
join to newfile for cltpolno = s.polno;
     field poltype,polplan
use newfile
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use policy
copy to templ field polno,poltype,polplan,polamont for;
        poldate >= start:date .and. poldate <= end:date
use agent
copy to temp2 field agtcname for agtname = agentid
use client
select secondary
use temp2
select primary
join to newfile for cltname = s.agtcname;
        field cltpolno
use newfile
select secondary
use templ
select primary
join to final for cltpolno = s.polno;
     field poltype,polplan,polamont
use final
sort on poltype to finalsort
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.5.1

DESIGN 5

REPORT FORM   SALESRGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: poltype
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL      WIDTH,CONTENTS
001      25,polplan
ENTER HEADING: PLAN
002      10,polamont
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.5.2

DESIGN 5

PROGRAM EXECUTIONS

```
. do design5a
Enter Client's Name (Last, First) :Gould, Pat
00001  Reed, Richard
0000i  LIFE Whole Life
00002  ANN  FPA
.


. do design5a
Enter Client's Name (Last, First) :Oxford, Dan
0000i  Doe, Ronald
0000i  IRA  Vista
00002  LIFE 10 Pay Term
00003  IRA  Putnam High Yield
.


. do design5a
Enter Client's Name (Last, First) :Seeker, Jan
00001  Thompson, Sharon
00001  LIFE Single Premium Life
.
```

```
                    SALES TOTALS BY PRODUCT TYPE

              PLAN               AMOUNT

     * TOTAL FOR PRODUCT TYPE:  IRA
     Fidelity Overseas              10000
     ** SUBTOTAL **
                                    10000

     * TOTAL FOR PRODUCT TYPE:  LIFE
     10 Year Paid Life              50000
     Whole Life                     20000
     ** SUBTOTAL **
                                    70000

     * TOTAL FOR PRODUCT TYPE:  ANN
     FPA                             2000
     ** SUBTOTAL **
                                     2000

     ** TOTAL **
                                    82000
```

FIGURE 5.5.3

DESIGN 6

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use client
copy to temp1 field ename for client=clnt
use temp1
list
use policy
copy to temp2 field prodtype,product for client=clnt
use temp2
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use client
copy to temp1 field client for ename = agentid
use temp1
select secondary
use policy
select primary
join to newfile for client = s.client;
     field prodtype,product,date:sold,face:amt
use newfile
copy to temp2 for date:sold >= start:date;
           .and. date:sold <= end:date
use temp2
sort on prodtype to temp3
use temp3
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.6.1

DESIGN 6

REPORT FORM   SALESAGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: prodtype
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL      WIDTH,CONTENTS
001      20,product
ENTER HEADING: PRODUCT
002      10,face:amt
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.6.2

DESIGN 6

PROGRAM EXECUTIONS

```
. do design6a
Enter Client's Name (Last, First) :Gould, Pat
00001  Reed, Richard
00001  LIFE Whole Life
00002  ANN  FPA
.

. do design6a
Enter Client's Name (Last, First) :Oxford, Dan
00001  Doe, Ronald
00001  IRA  Vista
00002  LIFE 10 Pay Term
00003  IRA  Putnam High Yield
.

. do design6a
Enter Client's Name (Last, First) :Seeker, Jan
00001  Thompson, Sharon
00001  LIFE Single Premium Life
.
```

```
                    SALES TOTALS BY PRODUCT TYPE


        PRODUCT           AMOUNT

   * TOTAL FOR PRODUCT TYPE: ANN
   FPA                      2000.00
   ** SUBTOTAL **
                            2000.00


   * TOTAL FOR PRODUCT TYPE: IRA
   Fidelity Overseas       10000.00
   ** SUBTOTAL **
                           10000.00


   * TOTAL FOR PRODUCT TYPE: LIFE
   10 Year Paid Life       50000.00
   Whole Life              20000.00
   ** SUBTOTAL **
                           70000.00

   ** TOTAL **
                           82000.00
```

FIGURE 5.6.3

DESIGN 7

PROGRAM 1

```
set talk off
accept "Enter Client's Name (Last, First) " to clnt
use client_p
copy to temp1 field clname,selname,pname for clname = clnt
use temp1
list
```

PROGRAM 2

```
set talk off
input "Enter starting date for sales totals (YYMMDD) " to start:date
input "Enter ending date for sales totals (YYMMDD) " to end:date
accept "Enter agent's name (Last, First) " to agentid
use client_p
copy to temp1 for selname = agentid;
             .and. val(dateiss) >= start:date;
             .and. val(dateiss) <= end:date
use temp1
sort on ptype to temp2
use temp2
set eject off
report form salesagt to print plain
set print off
```

FIGURE 5.7.1

DESIGN 7

REPORT FORM SALESAGT

```
ENTER OPTIONS, M=LEFT MARGIN, L=LINES/PAGE, W=PAGE WIDTH
PAGE HEADING? (Y/N) y
ENTER PAGE HEADING: SALES TOTALS BY PRODUCT TYPE
DOUBLE SPACE REPORT? (Y/N) n
ARE TOTALS REQUIRED? (Y/N) y
SUBTOTALS IN REPORT? (Y/N) y
ENTER SUBTOTALS FIELD: ptype
SUMMARY REPORT ONLY? (Y/N) n
EJECT PAGE AFTER SUBTOTALS? (Y/N) n
ENTER SUBTOTAL HEADING: TOTAL FOR PRODUCT TYPE:
COL     WIDTH,CONTENTS
001     30,pname
ENTER HEADING: PLAN
002     10,pamt
ENTER HEADING: AMOUNT
ARE TOTALS REQUIRED? (Y/N) y
```

FIGURE 5.7.2

DESIGN 7

PROGRAM EXECUTIONS

```
. do design7a
Enter Client's Name (Last, First) :Gould, Pat
00001  Gould, Pat          Reed, Richard       Whole Life
00002  Gould, Pat          Reed, Richard       FPA
.


. do design7a
Enter Client's Name (Last, First) :Oxford, Dan
00001  Oxford, Dan         Doe, Ronald         Vista
00002  Oxford, Dan         Doe, Ronald         10 Pay Term
00003  Oxford, Dan         Thompson, Sharon    Putnam High Yield Trust
.


. do design7a
Enter Client's Name (Last, First) :Seeker, Jan
00001  Seeker, Jan         Thompson, Sharon    Single Premium Life
.
```

```
                    SALES TOTALS BY PRODUCT TYPE


          PLAN                    AMOUNT

* TOTAL FOR PRODUCT TYPE:  AN
FPA                                2000.00
** SUBTOTAL **
                                   2000.00


* TOTAL FOR PRODUCT TYPE:  IR
Fidelity Overseas                 10000.00
** SUBTOTAL **
                                  10000.00


* TOTAL FOR PRODUCT TYPE:  LF
Whole Life                        20000.00
10 Year Paid Life                 50000.00
** SUBTOTAL **
                                  70000.00

** TOTAL **
                                  82000.00
```

FIGURE 5.7.3

EXECUTION TIME

DESIGN	LINES OF CODE		APPLICATION				
	Online	Batch		Online Trials			Batch
				A	B	C	
				18.52	19.47	19.49	14.77
1	21	15		18.70	19.35	19.36	14.99
				18.72	19.51	18.84	13.94
			Avg.	18.66	19.44	19.23	14.57
				8.37	8.64	8.63	21.57
2	6	12		8.35	8.56	8.34	22.57
				8.43	8.61	8.31	22.53
			Avg.	8.38	8.60	8.43	22.22
				7.72	7.10	7.88	20.03
3	6	12		7.56	7.29	7.73	20.07
				7.68	7.20	7.83	19.64
			Avg.	7.65	7.20	7.81	19.91
				9.63	9.59	9.87	26.11
4	11	19		10.51	9.59	9.53	25.69
				10.05	9.14	9.61	25.86
			Avg.	10.06	9.44	9.67	25.89
				13.61	13.70	13.25	26.77
5	14	23		13.52	13.83	13.59	25.22
				13.78	13.73	13.30	25.08
			Avg.	13.64	13.75	13.38	25.69
				7.82	7.65	7.52	26.86
6	10	19		7.52	7.55	7.67	27.10
				7.70	7.54	7.63	26.54
			Avg.	7.68	7.58	7.54	26.83
				4.26	4.35	4.32	15.65
7	6	12		4.38	4.31	4.32	16.23
				4.23	4.31	4.36	15.84
			Avg.	4.29	4.32	4.33	15.91

FIGURE 5.8

CHAPTER 6: Conclusions

When designing a database, much consideration should be given to the particular environment it will most widely be used in. As shown by the results in the previous chapters, programs executed in an interactive environment tend to run as effeciently as the data can be accessed. See figure 6.1 for comparison graphs plotting the designs against execution time and lines of code used in the application programs. Figure 6.2 contains the same information as figure 6.1 but in design order so it is easier to make comparisons between execution time and the number of coding lines used for each design.

The more file accesses one has, generally speaking, the greater the overall run times will become. If it is known that a database will be most widely used in an on-line environment close attention should be made to group the data most often accessed into as few of files as possible and still maintain a schema that is easily understood. This helps in reducing the redundant data. An even greater benefit is that the number of lines of code used in implementation can be reduced significantly. With the cost of software development at what it is today, it brings a monetary significance into the picture as well.

In batch processing, by its nature, one is not too concerned with immediate response times when running reports. More attention should be given to having all the data available to run any required reports. This puts a great deal of responsibility on the systems analyst during the development phase of a database design project. It is important to know what the user wants when it comes to the types of reports that are required. A missing attribute in an entity can cause certain information to not be available as was the case in several of the schemas used in this project. Modification to the database would then be required.

Future work that could be done relating to this project would be to use a different database management system. DBASE II is a powerful database, but one of the limitations of dBASE II is that it can not have more than two files open at a time. There are more user friendly databases on the market, such as dBASE III and III+, which have greater report generating capabilities.

More application programs could be developed to see whether the trends discussed in the previous chapters consistently hold true. Larger files could also be used to tell whether execution time patterns are affected proportionally.

In summary, the way a database system is designed, weighs heavily on the type of environment it is going to be used in. It is up to the systems analyst to make these distinctions so a system can be designed to process data as effeciently as possible.

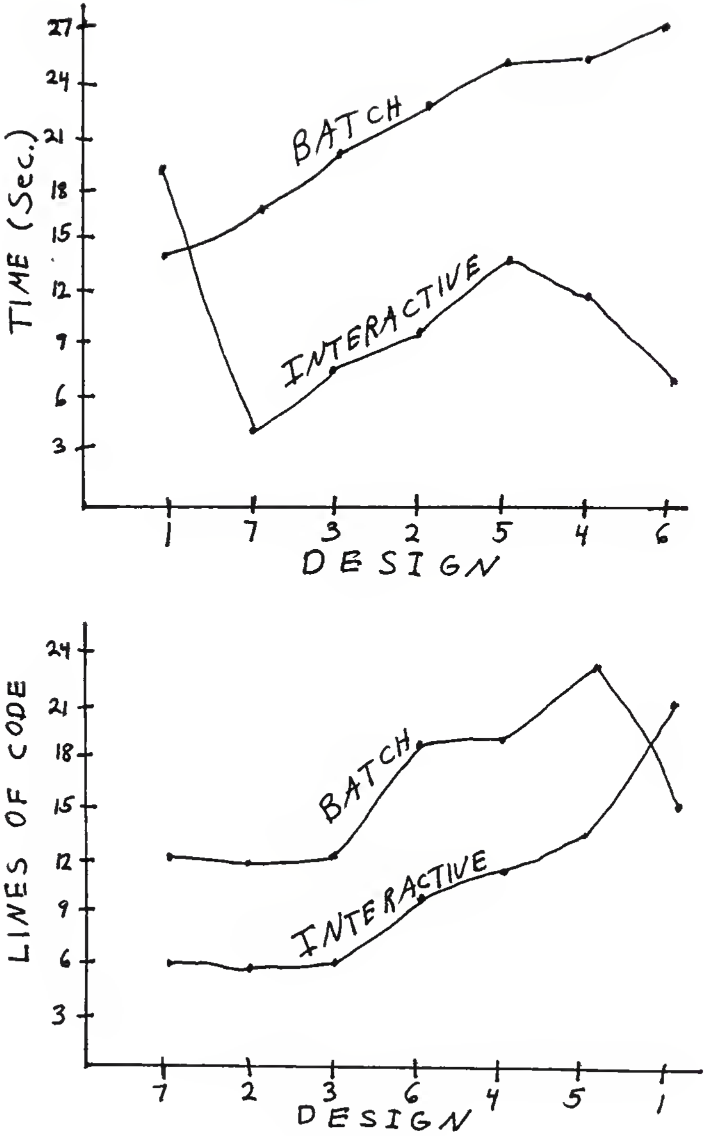

TIME (Sec.)
27
24
21
18
15
12
9
6
3
BATCH
INTERACTIVE
1
7
3
2
5
4
6
DESIGN
LINES OF CODE
24
21
18
15
12
9
6
3
BATCH
INTERACTIVE
7
2
3
6
4
5
1
DESIGN

FIGURE 6.1

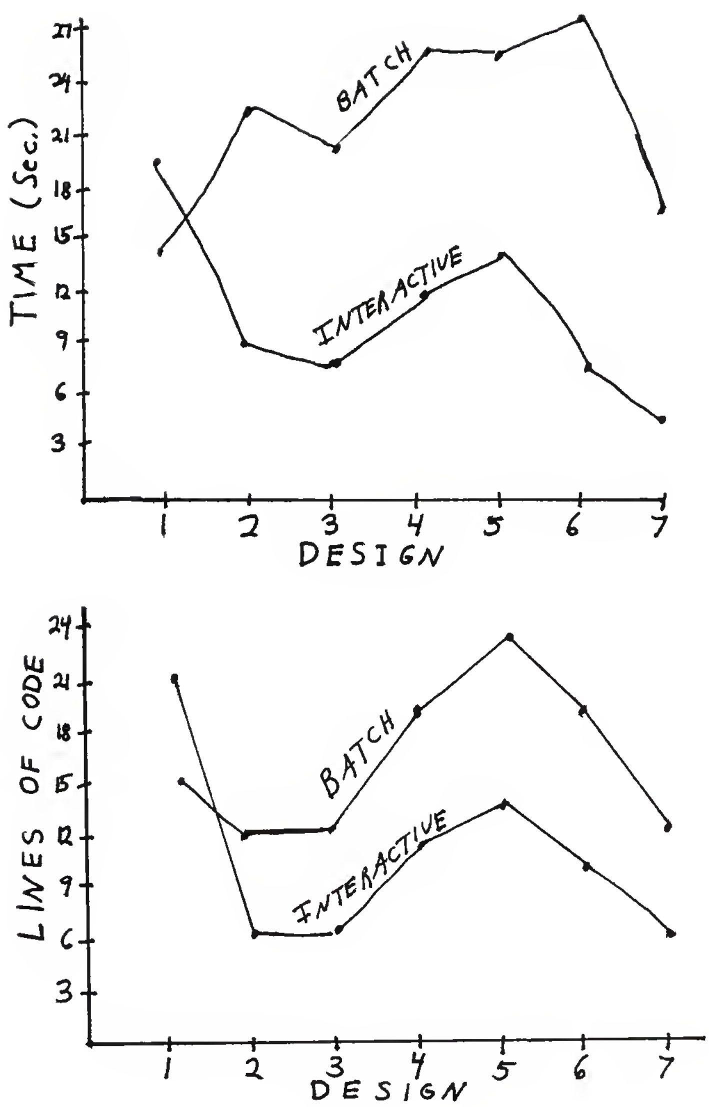

TIME (Sec.)
27
24
21
18
15
12
9
6
3
BATCH
INTERACTIVE
1
2
3
4
5
6
7
DESIGN
LINES OF CODE
24
21
18
15
12
9
6
3
BATCH
INTERACTIVE
1
2
3
4
5
6
7
DESIGN

FIGURE 6.2

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A COMPARISON OF SEVEN RELATIONAL DATABASE SCHEMAS

by

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B.S., Pittsburg State University, 1978

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

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1987

ABSTRACT

Very little information can be found in the literature comparing different schemas using the same application environment. In this paper, comparison of seven different schemas is made using dBASE II as the database management system.

Two application programming problems simulating online and batch characteristics, were implemented on each of the seven schemas and comparison was made on the basis of the number of lines of codes used to write the programs and the execution time of each. From these determinations, some guidance is provided to database designers to predict the type of schema needed to meet a particular kind of application programming need.