A COMPARISON OF DATABASE MANAGER RECOMMENDATIONS WITH THE RECOMMENDED UNDERGRADUATE DATABASE SUBJECT MATTER OF THE DPMA AND ACM INFORMATION SYSTEMS MODEL CURRICULA

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THE RESEARCH PROBLEM

Introduction

In the decade of the 1970's, two educational organizations undertook the long-overdue task of creating a Computer/Information Systems model curriculum at the undergraduate and graduate level.

The two organizations involved were the Data Processing Management Association Education Foundation (DPMA) and the Association for Computing Machinery (ACM).

Both organizations advanced a model curriculum for Information Systems education. According to the Association for Computing Machinery Information Systems Model Curriculum (1982), the ACM began their research in the early 1970's with recommendations coming from the ACM Curriculum Committee on Information Systems. The Committee's purpose was the development of degree programs at the bachelor's, master's, and doctoral levels. The current ACM Information System's curriculum is a conglomerate of updates and revisions stemming from the advances in the field over the past nine years.

According to the Data Processing Management Association Education Foundation Model Curriculum (1981), the DPMA began their research efforts in the late 1970's. The final report (DPMA Model Curriculum for Undergraduate Computer Information Systems Education) was the result of the combined efforts of many dedicated specialists in the

computer area. Computer educators, data processing managers, information system managers, and professional computer specialists identified the need for a comprehensive education and training program in the commercial programmer/analysts area. This curriculum model was the end result of two national questionnaire surveys, six regional conference/workshops, and numerous conversations with education, business, and computer experts.

One of the core courses recommended was Data Base Program Development (DPMA) or Data Management (ACM). Both courses deal with the management of data and databases in the operational Information Systems environment.

Statement of the Problem

This study was initiated to determine which model curriculum's database course content (ACM vs. DPMA) is preferred by database managers. Specifically, the study attempted to look at recommended course content and the changes, if any, recommended by database managers.

The analysis of the information gained by this study should be of significance to anyone interested in obtaining a job or training someone in the database area. Specifically, the analysis should be of value to both the computer education and computer business community. The analysis will also be of interest to the two organizations (DPMA, ACM).

Purpose of the Study

The principal purposes of this study were to determine (1) what subject matter database managers feel should be taught to database

employees and (2) which model curriculum most closely resembles these recommendations. To accomplish these purposes, this study used a questionnaire to obtain the opinions of the database managers. The questionnaire was sent to database managers who are currently working for United States companies listed in the current "Directory of Online Databases." The listing, which includes 465 potential respondents to the mailing, enabled the researcher to survey by means of a questionnaire a representative sample of database managers.

Current research has dealt mainly with courses in the two curricula. Although some research into the specific topics has been done, more information is needed in this area. Specifically, this study examined the database management area.

Specifically, the study revealed (1) a clearer picture of the educational backgrounds and work histories of database managers/administrators, (2) an in-depth study of the database management course including the following: topics to be included, the approximate importance of the topics recommended by the ACM & DPMA Model Curriculums, and other relevant information, and (3) database systems used, and the configuration of the following: DBMS, database file organization, security measures, hardware types, and other relevant information.

Importance of the Study

Currently, both the ACM and the DPMA are doing studies to determine the credibility of their respective curriculum models. These studies pertain mainly to how the respective curricula are being adhered to in the educational environment.

Therefore, a gap exists. What topics need to be taught in each

course? Are the current curriculum models addressing the needs as seen by the database managers? Curriculum course content must be continuously updated in order to retain its validity.

Other important questions have been answered by this study. What do database managers know about the ACM or DPMA curriculum recommendations? Which model curriculum do database managers prefer? Do database managers feel higher education is doing an adequate job in training people who work with today's databases? What do database managers believe can be done by educators to improve this training? This study has addressed these as well as other questions.

It is generally agreed that some type of standardized curricula should be adopted at the secondary level. But even educational institutions with the best of intentions may graduate ill-trained and unprepared computer professionals. Research in the information systems area must be continued if educational institutions are to be successful in the job of educating individuals in such a dynamic, ever-changing profession.

Limitations of the Study

This study is limited to a survey of database managers/administrators in the United States of America.

This study may be limited because the sample, drawn from the "Directory of Online Databases," does not directly represent organizations which do not appear in this listing, nor does it represent international databases. Certain generalizations and any implications of the study should be considered in relation to the limitations resulting from these restrictions.

Definition of Terms

To help clarify and interpret the data, the following terms are defined as they are used in this study:

Access -- The manner in which files are referenced by a computer.

ACM -- (Association for Computing Machinery) A professional organization that is dedicated to the development of information processing as a discipline, and to the responsible use of computers in our fast changing society.

ADABAS -- A system (pronounced AID-A-BASE), or the Adaptable Database System, marketed by software AG or North America. It uses inverted lists to maintain secondary indexes on files. These files can be coupled together to represent network structures.

Common Business Oriented Language (COBOL) -- A common procedural language designed for commercial data processing applications. COBOL has been further developed and defined by a national committee of computer manufacturers and users. This language was designed for business data processing procedures. The language is intended as a means for directly presenting any business program to any suitable computer for which a compiler exists.

Communications Device -- A mechanism (hardware or hardware-software) capable of sending data to a queue and/or receiving data from a queue.

Compiler -- A program which translates a program written in a higher level language into a machine language object program.

Computer -- A device capable of accepting information, applying prescribed processes to the information, and supplying the results of

these processes. It usually consists of input and output devices, storage, arithmetic, and logic units, and a control unit.

Computer Information System (Bus.) -- A term used synonymously with Information Systems.

Core Storage -- A storage within the central processing unit of the computer, so called because this storage exists in the form of magnetic cores.

Database -- A collection of files whose records cross reference one another. As with files we can have storage or internal data bases, conceptual data bases, and external data bases.

Database Administrator/Manager -- A person or group of experts charged with the administration of all use of a database or databases.

Data Base Management System (DBMS) -- A software program allowing database descriptions to be independent from computer program components. It provides the capability of describing the logical relationships between files, records, or fields to facilitate efficient maintenance and access of the database.

Data Processing -- A preparation of source media which contain data or basic elements of information and handling of such data according to precise rules of procedure to accomplish such operations as classifying, sorting, calculating, summarizing, and recording (also referred to as information processing).

Data Processing Management Association (DPMA) -- A professional national organization which has created a well-known information systems curriculum.

Direct File Organization -- A file system used primarily for random processing. Direct organization records are in no particular

order on the file. Direct organization does not support any particular correspondence between record content and file address. It is left to the programmer to establish a way of correlating records to file locations.

Distributed Database -- A database in which files and fragments of files are geographically distributed among different sites.

File -- A collection of records.

Hierarchical Database -- A database in which every record has at most one parent record.

IDMS (Integrated Data Management System) -- A system marketed by Cullinane Corp. Its design is based on the CODASYL DBTG data base model. IDMS data is physically represented on direct files (BDAM) using relative block addressing.

IMS (Information Management System) -- A system marketed by IBM, and based on the DL/1 hierarchical model. Fields are grouped into segments, segments into database records, and database records into a database. Segments are related by a hierarchy, or tree, and all twin segments are ordered by values that occur in sequence fields.

Index -- A computer storage position or register, the contents of which identify some particular element of a record.

Indexed Organized Files -- An indexed data organization in which the position of each logical record in a file is determined by indexes created with the file and maintained by an operating system. The indexes are based on keys provided by a user.

Information Systems -- A system in which the network of all communication methods within an organization are derived from a data processing unit or computer. The name used for a degree program in data

processing in the school of business.

Logical Record -- A number of related data items.

MAGNUM -- A database system based on the relational model. It is supported by TYMSHARE, a time sharing vendor. MAGNUM is a complete computer language. It has computational capabilities as well as data base features.

Model 204 -- A data base system marketed by Computer Corporation of America.

Network Database -- A data base in which at least one child record has more than one parent record.

Operating System -- A set of manufacturer-developed programs that perform three functions: (1) they provide coded instructions for certain repetitive operations, (2) they keep track of the running time of each job, and (3) they schedule the sequence of jobs so as to perform the work in the shortest possible time.

Physical Record -- A group of characters or Records which are treated as an entity when moved into or out of core storage.

Programming Language -- A specific language used to prepare computer programs.

Queue -- A logical collection of messages awaiting transmission or processing. It is used in teleprocessing.

Random Access -- A system in which individual records can be referred to in a nonsequential manner.

Record -- A set of one or more related data items grouped together.

Relational Database -- A database in which the conceptual files are all relations.

Sequential Access -- A system in which records are referred to one

another in the order in which they appear on the file.

Systems Analyst -- (Systems Engineer) An individual who is responsible for the performance of systems analysis for all or part of the business system during any, or all, of the phases of its life cycle.

System 2000 -- A system maintaining a database and its inverted files on a group of fixed-length-record direct (BDAM) physical files. It is marketed by MRI Systems Corporation. This DBMS uses hierarchies to represent databases.

TOTAL -- A database system marketed by CINCOM Systems. It represents data in networks. TOTAL allows the database administrator more flexibility in deciding how the data is physically stored in files.

CHAPTER II

REVIEW OF RELATED LITERATURE

For over a decade two organizations have been honing their respective information systems model curriculums. Vanecek and Guynes (1982) contends, in all this time, the two factions (DPMA and ACM) have zipped along as though the other did not exist. Unfortunately, the BCIS educator is going to be caught in the middle.

Many articles have been written about the DPMA and the ACM model curriculums. As of now, Vanecek and Guynes (1982) states no one has yet suggested a reconciliation or a combining of the two curriculum development efforts.

The curriculums have areas that coincide, as well as areas that diverge greatly. Many scholars believe the two curricula should be written so they combine the best parts of both into one single information systems model curriculum. According to Michael T. Vanecek and Carl Stephen Guynes (1982), the best parts would be difficult to discern, but the results would be worth the effort.

It is not the purpose of this study to decide whether the two curriculums should be combined; but a comparison of what is included in both curriculums and a short history of how they came into existence is relevant to this study. Some background knowledge on the status of the information systems degree programs in higher education will also prove valuable.

At the present time, according to Cerullo (1981), more than 60 schools of business offer Information Systems degree programs. There are also over 80 AACSB schools that offer some type of database course in their information systems curriculum.

The demand for qualified professionals in the field of Computer Science/Information Systems is increasing at a steady rate. Wanous, Wagner and Hallam (1979), state that people are gravitating toward this area because salaries for some occupations in this field rank among the highest offered in business.

The purpose of any curriculum ~~is to set up~~ guidelines that promise to be beneficial to the educational area in question--in this case, "Information Systems."

A curriculum should address many things. According to Martin, Spence and Guynes (1981), education should consist of a familiarization with theories and techniques, integrated with an opportunity to apply these theories and techniques to realistic business applications.

Educators must also stay out of the stagnation trap. An Information Systems curriculum must be a "living document." You cannot cast the courses and topics in concrete and expect any curriculum to remain valid for any extended period of time. Spence, Grout, and Anderson (1981) contend business and academic communities generally agree on the knowledge base for business school graduates; however, there are sufficient differences to warrant continual assessment and appraisal by the academic community for students to stay abreast of changing demands.

This same idea holds true for the Information Systems graduate. Needed knowledge is continually changing. A curriculum must be able to change with the times.

The Information Systems curriculum must stress business applications. Why? This is the area in which most of the current work is being done. Deishen (1979) states courses in a Data Processing curriculum emphasize business application and often include instruction in operations, unit-record equipment, and data center management.

Another area that is gaining importance is the Database Management discipline. Database design and implementation has become one of the fastest growing areas in information systems of the 1980's.

According to Paul (1982), the total database management system (DBMS) market will increase in total revenues from about $137 million today to possibly $1 billion by 1987, growing at a rate of between 25 percent to 35 percent each year according to a market survey released here by Frost & Sullivan. The survey entitled "Data Base System Software Market in the U.S." was sent to a study group of 75 DBMS vendors and over 3000 users.

Training of future DBMS personnel is fast becoming a critical need. Most experts believe that the right kind of training can only be gained through the use of instructors who have actual database experience.

Wehr and Gregorie (1982) stated because of time constraints, training personnel to their duties in a DBMS environment is often inadequate. Traditional methods of Data Processing training, such as audiovisual courses and courses developed and taught by in-house training staff, are inadequate because of the specialized skill needs in a DBMS environment. Audiovisual courses fall short because of the technical nature of the DBMS which generates many questions that require the presence of an instructor to clarify details before processing the other material. The use of an in-house instructor is also a problem because those who

are already DP instructors probably do not have the rigid background in the DBMS. Successful DBMS training requires knowledge that can only be acquired through actual experience.

Higher education is not the only area having difficulties in the training of DBMS personnel. It must be recognized that higher education is not a specific application training institution. Colleges teach basic concepts. They teach people how to learn. They show prospective employers who can be trained. No quarrel should exist concerning whether DBMS experience as a prerequisite for teaching DBMS techniques. But this cannot always be done.

The DPMA Information Systems Curriculum

The DPMA model curriculum has been in development since 1978. Dr. Thomas Athey, along with countless others, has painstakingly molded this curriculum step-by-step into its present form. Jones (1980) states the computer information systems program developed by DPMA is intended for an academic home in the business school.

Many universities are still fighting the Computer Science/Information Systems battle. Most computer science programs are handled by the math department while information systems usually are covered by business schools.

According to Guynes, Vanecek, and Zant (1983), it is becoming increasingly evident that in the future there will be at least two major computer education programs at all quality universities. It is not academically sound to try to offer a pure information systems program outside of the colleges of business.

With this in mind, the DPMA has come up with an information systems

model curriculum.

The DPMA Information Systems model curriculum is comprised of (1) seven required core courses, (2) three other computer information system courses to be chosen from a set of eight recommended elective courses, and (3) a minimum set of business support courses.

Following are the curriculum core courses:

CIS-1, Introduction to Computer-bases Systems -- This course is an introductory computer course designed to give the student the beginning knowledge in computers and data processing at the lower division level.

CIS-2, Applications Program Development I -- This course consists of an introduction of the COBOL programming language to the lower division student. It is basically a COBOL programming course.

CIS-3, Applications Program Development II -- This course consists of advanced COBOL programming techniques given at the lower division level. It is basically a continuation of the first COBOL course.

CIS-4, Systems Analysis Methods -- This course consists of an introduction to the systems development life cycle with an emphasis on techniques and tools of system documentation and logical system specification.

CIS-5, Structured Systems Analysis and Design -- This course consists of advanced system design and coverage of the strategies and techniques of structured systems development at the upper division.

CIS-6, Database Program Development -- This course is an introduction to database management systems, emphasizing software design and programming in a database environment. It is designed to be taught as an upper division course.

CIS-7, Applied Software Development Project -- This is a capstone systems course integrating a comprehensive systems development project with the knowledge and abilities gained through the other computer-related courses.

The following courses are upper division electives. Choose three per degree program.

CIS-8, Software and Hardware Concepts -- This course is a survey of the relationships between hardware architecture, applications software, and systems software as it relates to the computer system.

CIS-9, Office Automation -- This course deals with the office as an automated center of business activity, operational logistics, and decision support.

CIS-10, Decision Support Systems -- This course is the study of decision support systems theory. It consists of an analysis of the highest level of information support systems which will aid managers in decision-making.

CIS-11, Advanced Database Concepts -- This course is an in-depth investigation of data modeling, systems development, and database administration.

CIS-12, Distributed Data Processing -- This course is an introduction to distributed systems and their impact on the business enterprise.

CIS-13, EDP Audit and Controls -- This course is an introduction to electronic data processing auditing with an emphasis on EDP controls, audit types, and audit techniques. The effects of this area on system development are also explored.

CIS-14, Information Systems Planning -- This course is an introduction to using information systems in strategic planning. Specifically,

the financial, technical, and strategic information process.

CIS-15, Information Resource Management -- This course is a seminar on the management of the information systems resource. An emphasis exists on planning, organizing, and controlling user services and managing the system development process.

The recommended business support courses are (1) BUS-1--Financial Accounting Principles, (2) BUS-2--Managerial Accounting Principles, (3) BUS-3--Quantitative Methods, (4) BUS-4--Principles of Managment, (5) BUS-5--Principles of Marketing, (6) BUS-6--Principles of Finance, (7) BUS-7--Organizational Behavior, and (8) BUS-8--Production and Operations Management.

Also implied in the curriculum is a set of general education courses in the arts and sciences and humanities areas. These courses will be used to broaden the student's awareness and to instill in the student a sense of cultural literacy as well as quantitative, analytical, and evaluative expertise.

DPMA Model Curriculum (A Brief History)

The DPMA's CIS CURRICULUM was initiated by Dr. Thomas H. Athey and numerous others in 1978 to give the information systems career area a standardized curriculum model to follow. Athey (1981) states the curriculum is the result of over two years of effort in studying the academic preparation required by persons who will enter the field of information systems as application programmer/analysts and who will grow professionally within normal career paths open to business computer specialists.

The DPMA model curriculum is designed for use in four-year

undergraduate programs. Although the creators of the curriculum feel their program should be offered through business schools, they also feel applied computer science programs requiring concentration of business courses would suffice. Once again, it should be emphasized that any model curriculum is a "living" document. It is a product of a systematic process designed to blend in new requirements and changes that occur in computer education. This study is not intended to be a conclusive answer to the Information Systems educational curriculum question.

According to the proponents of the DPMA model curriculum, this new discipline of undergraduate study will be known as COMPUTER INFORMATION SYSTEMS (CIS). The Data Processing Management Educational Foundation (1981) contends that Computer Information Systems is an emerging academic discipline with goals, subject matter, and problem-solving processes sufficiently different from other computer-related disciplines to warrant special attention. To understand these differences, it is convenient to conceptually divide the computer disciplines into two broad categories: (1) those that educate developers of basic computer technology and (2) those that educate users of that technology. In the former category are the traditional disciplines of computer engineering and computer science; in the latter category is the growing area of computer information systems.

The DPMA Education Foundation will continue to develop and help implement and DPMA model curriculum for undergraduate computer information systems education. To do this, two committees are currently working on continued development and implementation of the curriculum. The Curriculum Committee will ensure that the model curriculum remains current. The Tracking Committee is trying to determine who is using

the curriculum (for example, four-year institutions, two-year institutions, or others).

ACM Information Systems Curriculum

When curriculum design is considered in computer education, the ACM has probably been involved more than any other organization. The ACM has been developing an information systems curriculum since 1971.

In recent years, the ACM Curriculum Committee on Information Systems has revised the ACM information system curriculum. The revisions have resulted in the following: (1) two programming courses, and (2) ten information systems courses divided into three areas:

1. Prerequisites, premajor, and functional area requirements
2. Information system technology
3. Information systems concepts in organizations

The specific ACM recommendation for the Information System (IS) curriculum follows:

Prerequisites/Premajor/Functional Area Requirements

P1--Prerequisite: Computer Programming -- This course introduces the student to computer programming using a common high level algorithmic language (FORTRAN or PASCAL). The intention of this course is to develop programming skills necessary to solve problems using a computer.

P2--Prerequisite: Quantitative Methods -- This course introduces the concept of quantitative methods. It also allows the student to learn about and use a wide range of analytical models. The student

should develop skills necessary to solve scheduling problems, allocation problems, queueing problems, and inventory problems in order to use an appropriate solution technique.

Information Systems Technology

IS1: Computer Concepts and Software Systems -- This course is an introduction to hardware and systems software.

IS2: Program, Data, and File Structures -- This course is a combination of data structures, file handling, and COBOL (or PL/1) programming.

IS4: Data Base Management Systems -- This course is taught fundamentally to increase the students' knowledge about how data resources can be managed to support effectively information systems in organizations.

IS6: Data Communication Systems and Networks -- This course introduces the student to distributed processing systems and teleprocessing.

IS7: Modeling and Decision Systems (Graduate Program Only) -- This course is an introduction to modeling and decision support systems. The course is valuable to anyone who will have to make complex decisions.

Information Systems Concepts in Organization

IS3: Information Systems in Organizations -- This course is an introduction to systems theory, information flow, and the way of information systems.

IS5: Information Analysis -- This course is an introduction to

the systems life cycle and to system analysis. The course covers the application system development process.

IS8: Systems Design Process (Prerequisite: IS5; co-requisites; IS6, IS7) -- This course is designed as a rigorous approach to systems design and the processes involved with the study, design, and implementation of a new system.

IS9: Information Systems Policy (Graduate Program Only) -- This course deals with the information system function as a support to the overall operations of the organization. Specifically, the evaluation of administrative and management issues.

IS10: Information Systems Projects (Prerequisites: IS7 and IS8; co-requisite IS9) -- This is a capstone course that consists of a complete systems development project. By the use of this course, all of the concepts of the previous coursework are used in the system development.

ACM Information Systems Curriculum
(A Brief History)

The ACM Information Systems Curriculum (1981) is a revision and update of the 1972 and 1973 reports.

According to Nunamaker, Couger, and Davis (1982) the ACM curriculum efforts for information systems (as contrasted with computer science) began with the ACM Curriculum Committee on Computer Education for Management. This committee, supported by a National Science Foundation grant, was established to evaluate the state of the art and to develop a series of recommendations for improving computer education for management. To provide the committee with material for its study

of curricular needs, five regional meetings were held in the United States in 1970. At each meeting a broad section of invited academicians and practitioners considered the state of curricula in business schools.

After this meeting, other meetings were held and the first curriculum guide for graduate programs in information systems was published in 1972.

Nunamaker, Couger, and Davis (1982) also state a complementary report on curriculum recommendations for undergraduate programs was published by the committee with J. D. Couger as editor. Detailed course descriptions were presented.

All of the reports maintained that supportive computer personnel would have to cope with increased responsibilities as well as increased role playing in the efficient and successful implementation of any computer-based system.

The current ACM curriculum is the result of revisions and updates which still go on today.

What motivated the need for a revised curriculum? Nunamaker, Couger, and Davis (1982) report the motivations for the revised curriculum built upon those consideration changes in the importance of information systems, advances in technology, and an increased need for information systems management skills.

DPMA vs. ACM: A Comparison of the Likes and Differences

When given a cursory review, the two curriculums appear to be quite similar. According to Vanecek and Guynes (1982) the DPMA defines

an initial group of 15 courses, whereas the ACM defines a group of 12 courses. If a very coarse view is taken, roughly the same material is covered in both.

For example, Figure 1 illustrates the relationship of the two curriculums.

Many articles have been written about these two model curriculums. It still must be acknowledged that the Association for Computing Machinery (ACM) is scientific and technical in nature, while the Data Processing Management Association (DPMA) has always looked at information systems from a purely business oriented point. This has wide spread ramifications for any curriculum the two organizations would propose.

A look at the chart in Figure 1 reveals that all of the required DPMA courses have ACM counterparts except for CIS-2 (beginning COBOL). The DPMA Model Curriculum has five more courses than the ACM Model Curriculum. This is due partly to the fact the Data Processing Management Association adds many business topics to their information systems curriculum. Therefore, not all of the Data Processing Management Association course material can be covered by the Association for Computing Machinery curriculum, CIS-9 (Office Automation), CIS-11 (Advanced Database Concepts), and CIS-13 (Electronic Data Processing Auditing) have no counterparts in the Association for Computing Machinery model curriculum.

Where do the differences occur? Most of the topics covered by the two curriculums are the same. But, if course content is examined,

	ACM											
DPMA	IP1	IP2	IS1	IS2	IS3	IS4	IS5	IS6	IS7	IS8	IS9	IS10
CIS-1	X											
CIS-2												
CIS-3				X								
CIS-4							X					
CIS-5										X		
CIS-6						X						
CIS-7												XX
CIS-8			X									
CIS-9												
CIS-10									X			
CIS-11												
CIS-12								X				
CIS-13												
CIS-14					X							
CIS-15											X	

Source: Vanecek, Michael T. and Carl Stephens Goynes. "Business Computer Information Systems DPMA vs. ACM: Now What?" Interface, The Computer Education Quarterly, (Winter 1981-1982), Volume 3, Issue 4, pp. 18-22.

Figure 1. DPMA vs. ACM Curriculum Courses

the emphasis is quite different. One example is the topic of programming languages. The DPMA model curriculum emphasizes Common Business Oriented Language (COBOL). In fact, the Data Processing Management Association curriculum assigns two full courses to the study of this high-level programming language. The Association for Computing Machinery curriculum supports the study of a high-level algorithm language such as Formula Translation (FORTRAN) or PL/1. COBOL is barely mentioned. It can be concluded from this analysis that the Data Processing Management Association's model curriculum is more business minded whereas the Association for Computing Machinery will always keep its scientific and technical roots.

Michael Vanecek and Steve Guynes (1982), studied the two curriculums and concluded the following: (1) the Association for Computing Machinery curriculum appears to be more oriented toward the requirements of the American Assembly of Collegiate Schools of Business (AACSB) accreditation, (2) neither curriculum adequately covers the information systems graduate programs. The Data Processing Management Association ignores it and the Association for Computing Machinery says to duplicate the undergraduate courses but at a higher level, (3) the Data Processing Management Association curriculum has done a much better job of maintaining the business emphasis within their curriculum, while the ACM curriculum still has the computer science orientation.

A review of related research and literature reveals there is a definite need for more research in the area dealing with these model curriculums. Research can shed light on which curriculum, if any, should be supported by information system professionals. More research must be done in order to study the effects of specific course topics on

the students going out into the work force. Studies dealing with course content versus curriculum content are thus needed.

Database - Curriculum Definitions

No review of literature can be complete without a discussion of what a database is and the topics recommended by the ACM and DPMA model curriculum. The advantage a database and DBMS (Database Management System) brings to a business organization must also be explained.

A database management system gives users a single source of information which simplifies the data, reduces storage and allows the data to be checked, updated and accessed easier. A DBMS is usually a large program that must use a large, central processing unit and a sophisticated operating system.

According to Bridges (1982), as the database management system is used for more and more applications, the DBMS software utilizes more and more of the computers resources. Resource requirements of the DBMS can in fact cause an organization to upgrade its computer.

There are different types of data bases which are categorized according to the way the data is stored.

According to Thiel (1982), a relational DBMS, very simply, is designed so that users can take information from two or more existing files and create a third file - a file which exists in the user's view but doesn't necessarily exist inside the computer.

How can one teach a concept that must be experienced to be understood? The answer is not easy. This may be the most difficult part of teaching data base management. Higher education must address this question if there is to be any hope of teaching data base concepts at the

university level.

Another type of database has been created specifically for microcomputers. It is a fact that microcomputers are being used in larger numbers for business applications today. Many skeptics believe microcomputers cannot perform the functions needed to maintain a DBMS.

Ferris (1983) states that some DP pundits and users espouse a more optimistic view. Micros are powerful enough to handle many tasks that formerly were assigned to more capacious machines.

Educators must teach database users the use of micros as well as mainframes. Fortunately, it is much easier to learn how to use a microcomputer because of its user friendly nature.

Database design, database concepts, and their uses are topics which will endure for some time. Educators are behind, but it is not too late. Where is database technology going? The sky may be the limit!

According to Paul (1979), we are only at the beginning of the data base era. Three library organizations have just raised $6.1 million to be spent in the next five years in developing a National Library Network. The basis of this National Network will be an interconnection of all major data bases of book and periodical information in the country.

While this is a worthwhile venture, it is not a reality as yet. Many experts see a National Database Network in our future.

Database management and design must be taught to all types of business majors. The Information Systems specialist is not the only business major who needs this type of training. The main reason for any Information System is to supply management with the information needed to make the right decisions at the right time.

Horton (1983) contends that not too long ago, decision makers' primary problem was a lack of information. Today, the problem is not a lack but an overabundance of data and not enough of just the right kind of information needed.

Education must make information systems, management, marketing, accounting, and finance majors aware of this and other problems. They should also help industry formulate more practical solutions to their problems. Once again, experienced database users as database management instructors are the key.

The need for database knowledge is well established. More and more non-traditional students (over age 25), as well as traditional students, are turning to higher education for the practical knowledge needed to use a database. In the majority of cases the training does not exist. Oklahoma State University implemented a database management course during the fall semester of 1982. Many institutions teach database concepts as a part of the content of other information system courses. Actual database concepts are offered in approximately 35 to 40 percent of the information systems programs today.

According to Business Week (1983), the owners of the almost 3 million personal computers in the United States are beginning to find a new solution to their information needs--access to data bases that only big companies could once afford. Without corporate resources, individuals must often use the central library for research. And even then they must usually settle for out-of-date printed information.

Traditional business information publishers are moving to make their data available to personal computer users. Education must not only supply personal computer training but they should also supply

students with practical database experience on microcomputers.

Database Course Subject Areas

ACM and DPMA both recommend a large number of database topics. The main purpose of this study is to collect database managements opinions of the topics the two curriculum support. A brief explanation of these topics are germane to this discussion.

After comparing the two curriculum models, it became apparent that both model curriculums had topics in common. There were also topics recommended by only one model curriculum or the other. The topic areas in common will be discussed first.

Overview (database development, issues) - The first in-common topic area covers a broad subject. The overview defines what database processing actually is in definitional terms. It covers the advantages and disadvantages of database processing. Finally, it defines the basic components of a business database system.

According to Kronenke (1983), a business database system is a collection of five components that interact to satisfy business needs. The five components are hardware, programs, data, people, and procedures.

The database development stage includes the following topics. Kronenke (1983) contends developing a business database system is just like developing any other business computer system, only harder. The major stages of the development process are specify requirements, evaluate alternatives, design the system, and implement the system.

Applied Data Structures - An important area of database study is applied data structures. The knowledge students gain from this topic

will help them design databases, understand database models, and evaluate the advantages and disadvantages of different DBMS products.

Cushing (1982) states that if we were to study in detail the general content of files within a typical business organization, and the logical relationships that users perceive among individual data elements within those various files, we would find three basic types of logical data structures. These are called flat file structures, tree structures, and network structures.

A flat file is a file structure in which each record is identical to every other record in terms of field lengths and attributes used. Tree structures are hierarchical data relationships. Network structures are data structures which have relationships between multiple record types which use many-to-many relationships.

Hierarchical Data Model - A special model used to teach hierarchical data structure design is the hierarchical data model.

According to Tsichritzis and Lochovsky (1977), a hierarchical definition tree is a template for the actual database. The record types specify what types of records are allowed in the database. The links specify the permissible connections between the record types. A hierarchical database is a collection, or forest, of disjointed trees with record occurrences, or simply records, as nodes.

Network Data Model - A formal model used to represent network data structure design is known as a network model. It does this by representing attribute relationships of an entity set and the associations between the entity sets.

Bradley (1983) states that a database has a network organization when the relationships between the conceptual files give rise to a

network of relationships. A data base is organized as a network if a record can be found with more than one parent record.

Relational Data Model - A formal model used to represent relational database design is a relational data model.

According to Couger and McFadden (1984), in the relational model, all data are viewed as being stored in the form of tables. Powerful commands are used to combine data from various tables for inquiry and reporting purposes.

The main advantage of the relational model is the implication of relationships by data values. This model is logical because the data is represented in a format familiar to people. The most common data arrangement is the use of flat files.

Database Administration - The database administrator designs the internal scheme and chooses storage organizations and parameters to create a database that adequately serves the diverse requirements of the users in database administration.

According to McLeod (1983), interst in database has opened up an entirely new position in computing facilities - the database administrator, or DBA. This person manages the database. In large organizations, more than one person is needed. The duties of the DBA fall into four major categories: planning, consultation, operation, and control.

Data Environment, Management and Defining Data - The environment from which the data is collected, the management of the collected data, and defining just what data should be used is the subject of data environment management and defining data.

Sibley (1982) contends the general goals of data management are

part of a strategic plan for data in the organization. These goals include: making data accessible, controlling data, maintaining data continuity, reducing development costs, and reducing response time. These goals must be integrated with the overall organization strategic plan; however, frequently they are not.

Role of Database Information Systems - Concentrating on the organizations knowledge into a centralized system is the role of database information systems. This alleviates data redundancy, and allows the organization to save money by decreasing the amount of data storage space needed.

According to Atre (1980), as business experience with database management systems (DBMS) increased, the database administrator (DBA) function evolved from a purely technical to a management-oriented position.

Relational Systems, Relational Databases - A relational database tends to represent data as it exists. The relational model reduces data relationships into simple parts and represents these parts directly.

Sandberg (1976) states that the most fundamental property of a relational database system is that data is presented to the user as tables instead of as networks or hierarchies. Thus, the data is structured in the form of tables consisting of columns and rows, with the rows corresponding to traditional database records or segments and the columns representing fields within the records.

Use and Management of Databases - Most databases are managed by a Database Administrator (DBA). This management level person makes all the day to day decisions dealing with a database. The database itself

is managed by what is called a Data Base Management Systems (DBMS).

According to Plagman (1980), a data base management system is a generalized software system designed to manage the database, providing facilities for organization, access, and control.

The uses of databases seems infinitesimal. The applications for database technology will continue to grow far into the forseeable future.

The ten topics previously discussed are found as recommended topics in both model curriculums (ACM and DPMA). There are other topics recommended, but only by one model or the other.

The Association for Computer Machinery (ACM) also recommended the following twelve topics:

1. Basic Tech. Concepts for Data
2. Systems Resources for Data
3. Basic Machine Architecture
4. Searching and Sorting Techniques
5. Operating System Topics
6. Dynamic Storage Management
7. Database Management Systems
8. Integrated Databases
9. Memory Management
10. Use of High Level, User Oriented Data Language
11. DBMS Evaluation
12. Distributed Databases (Nunamaker, 1982, p. 787)

The Data Processing Management Association (DPMA) also recommends the following five topics:

1. Storage Device Characteristics and Physical Input/Output
2. Indexed Organized Files
3. Direct File Organization
4. Data Model Overview, DDL, DML
5. Character Codes (Adams and Athey, 1981, pp. 36-37)

Exhaustive research has been done for both curriculum in the database area in order to formulate specific course topics.

Summary

A thorough review of the related literature and research in the database area revealed a need for more studies to ascertain the topics to be taught to future database professionals.

Some agreement exists among business people and educators that Database Concepts should be an integral part of any information systems curriculum. The DPMA and ACM both agree that Database Management is an important part of any information systems study plan.

Only recently has the model curriculums for this area been developed. If the model curriculums are adhered to, then much needed uniformity will accrue to the information systems area.

Additional inquiry is needed to increase available knowledge of the configuration of any database course--particularly topics business leaders believe must be taught.

Chapter III

DESIGN AND PROCEDURES

Designed to obtain data from database managers who work for companies listed in the third issue of volume 4 of the Directory of Online Databases, this study focused on the opinions of database managers concerning the current suggested database management/concepts curriculums for higher education. Data was obtained from respondents regarding the following: the educational backgrounds and work histories of database managers/administrators, the database management course, and the configuration of database systems used.

Through descriptive data obtained, it is possible to show the percentage of database managers who support the ACM (Association for Computing Machinery) or DPMA (Data Processing Management Association) model curriculum topic suggestions for the data management/concepts course. The responding database managers provided input to reveal DBMS (Database Management Systems) status and trends including the type of DBMS organizational model used, security features, and the hardware configuration followed. The descriptive data are further used to show percentage relationships between the educational backgrounds of data base managers and database course subject areas selected, work experience of data base managers and database course subject areas selected, and other relevant data concerning database and database management/concepts course offerings.

This chapter elaborates on the research design by describing the study instrument used for data gathering, procedures used in data gathering, procedures used in data collection, and the various analyses made of the data to fulfill the purpose of the study.

The Study Instrument

A questionnaire was created to gather data for this study. The questionnaire was developed from a thorough study of related literature, examining other research questionnaires concerned with information systems, conducting a pilot study sent to database managers in the Oklahoma region, and through interviews and consultation with Oklahoma State University and Emporia State University faculty members.

The questionnaire was revised and refined through consultation with statisticians at Oklahoma State University, through faculty in the information systems area at Oklahoma State University and Emporia State University completing the questionnaire indicating any ambiguous or questionable items, through database managers completing the questionnaire, and through an evaluation of the questionnaire by the members of the researcher's dissertation committee. This consultation and evaluation resulted in some minor changes and clarifications on certain items.

The final version of the study instrument was a yellow, printed four-page, 8½ by 11 inch questionnaire (see Appendix A). The respondents were not asked to sign the study instrument. However, an identification number was included on the front of the questionnaire for follow-up purposes. The questionnaire contained the following three sections:

I. Database Manager/Administrator or DP Manager Personal Information

II. Database Course Subject Areas

III. The Database System Configuration

Section I, concerning information about the database manager/administrator or DP manager was to be completed by all respondents. Sections II and III were completed by database managers who felt they had the necessary educational and technical backgrounds. The questions were designed to elicit responses dealing with the manager's opinions of the subject topics recommended, memberships in professional organizations, and database system hardware and software configurations.

Section II of the instrument included the database topic areas recommended by the Data Processing Management Association (DPMA) Educational Model Curriculum, database topic areas recommended by the Association of Computing Machinery (ACM) Model Curriculum, database manager opinions on the worth of these topics, and respondents familiarity with the DPMA and ACM model.

The DPMA and ACM have both developed nationally recognized model curriculums for undergraduate information systems programs.

According to Aulgur (1982), the objective of this model curriculum (DPMA) is to provide graduates with the knowledge, skills, and attitudes to function effectively as applications programmer/analysts and with the educational background and desire for life-long professional development.

A study of both the DPMA model curriculum and the ACM model curriculum and the topics recommended for instruction in database management/concepts courses were utilized in developing a comprehensive list of

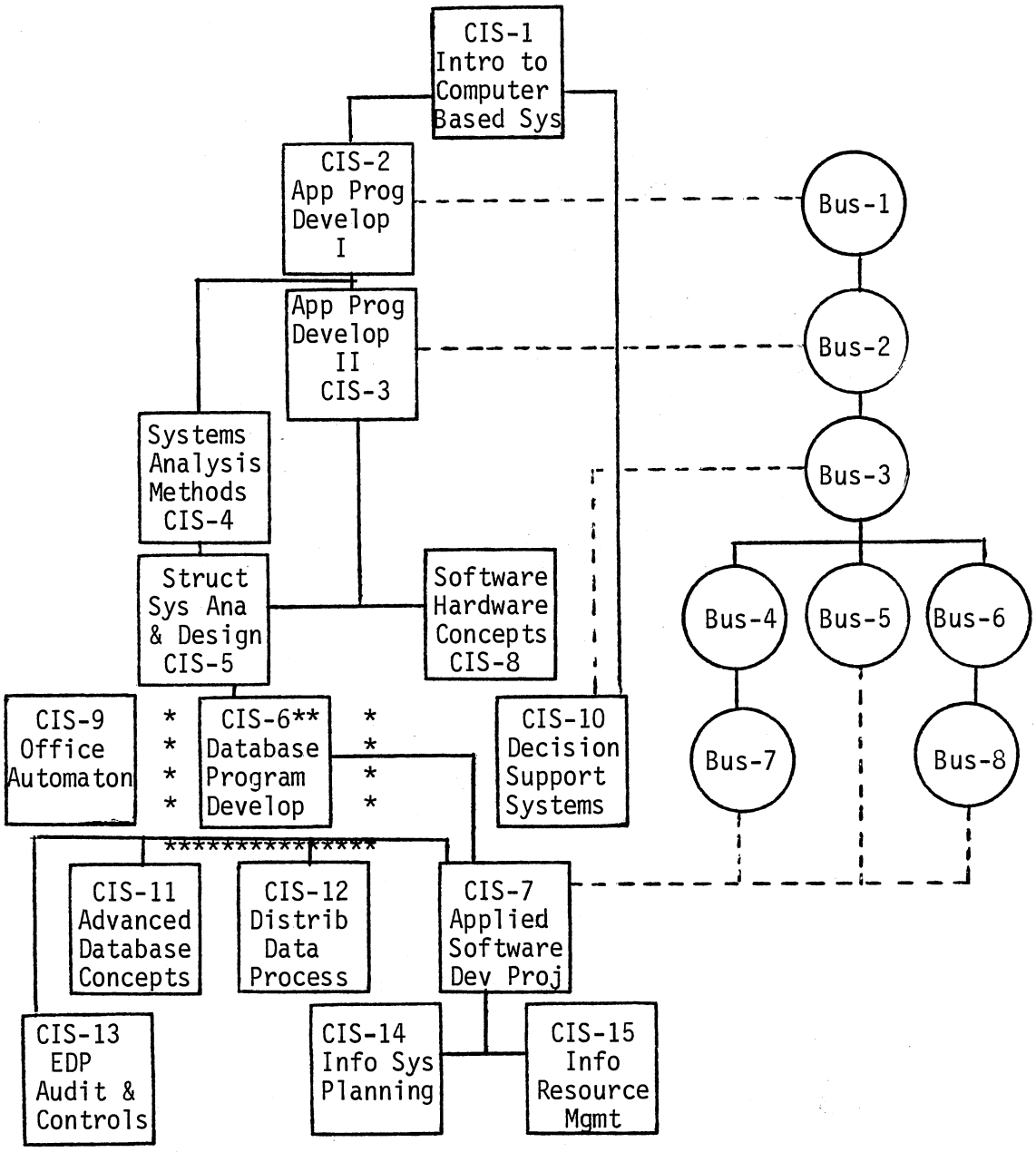
database course subject areas to be included in Section II of the study instrument. The model in Figure 2 is a conception of the DPMA model curriculum course recommendations. This model shows how the DPMA database course (Database Program Development) fits into the overall scheme of things. The model in Figure 3 illustrates how the ACM database course (Data Management) fits into the ACM's overall scheme.

To simplify the completion of the questionnaire, thereby encouraging response, the survey instrument was designed to be concise and easy to read and follow. To the extent possible the questions were formulated to be as clear, specific, and concise as possible in order to encourage reliable responses. Clear and complete directions were included with headings reflecting the purpose of the study, and professional quality reproduction was utilized.

Collection of the Data

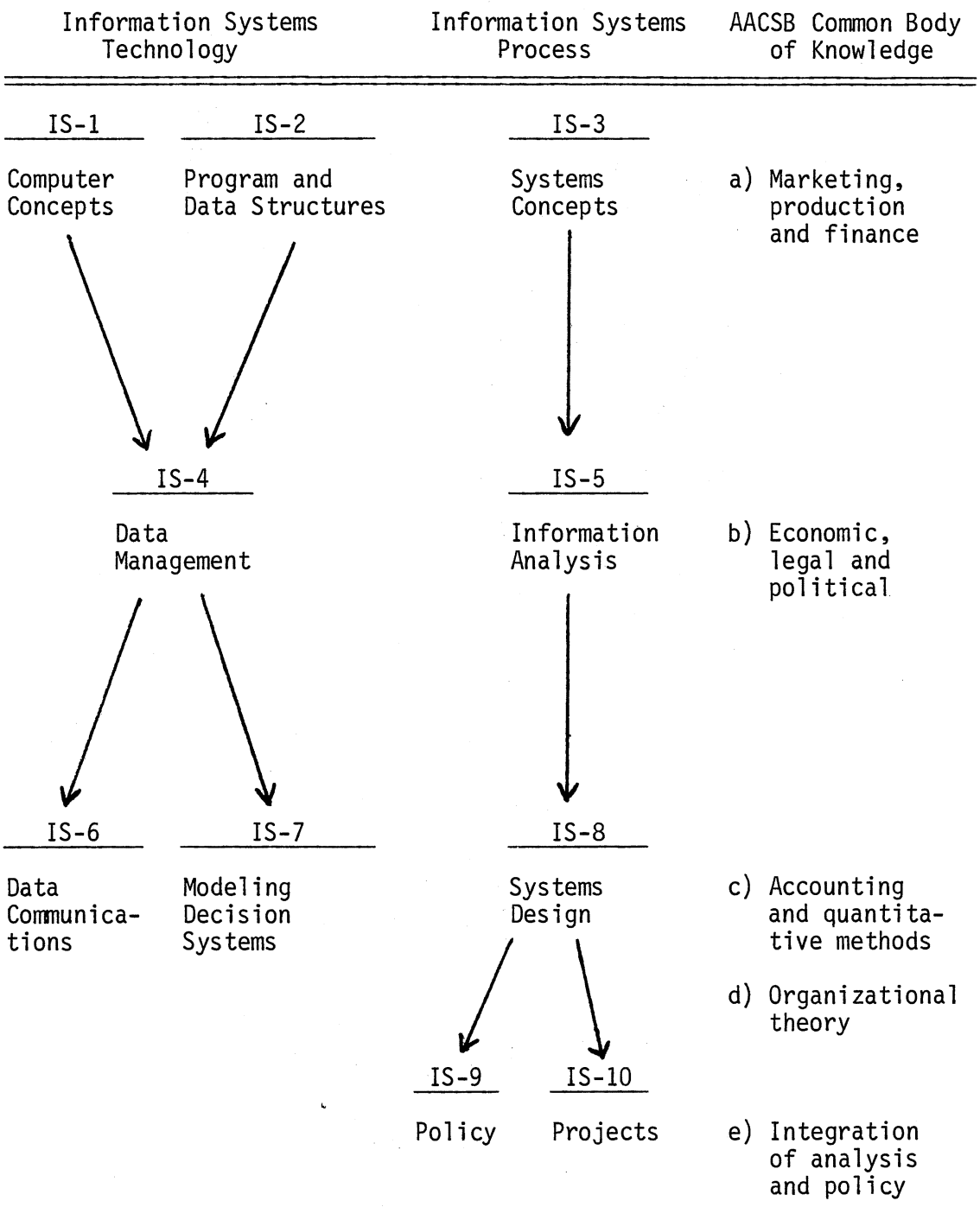
During the initial planning stage of this study, a decision was made to include only databases from the Directory of Online Databases which were located in the continental United States. The Directory of Online Databases was obtained and the process of selecting the population began. There are 1360 entries in the current issue of the database directory. After duplications and databases located outside the U. S. were deleted, 465 database locations were selected for the study.

The desired sample was chosen from the database directory and envelopes were addressed to all members of the sample. The original mailing was sent to 465 database organizations. The mailing included a cover letter, the questionnaire, and a stamped, self-addressed return envelope. Letters were addressed to the organizations with a request



Source: Adams, David R. and Thomas H. Athey, Editors, "DPMA Model Curriculum for Undergraduate Computer Information Systems Education", September 1981, Data Processing Management Association, Park Ridge, IL.

Figure 2. DPMA Computer Information Systems Model Curriculum



Source: Nunamaker, Jay F., J.D. Couger, and G.B. Davis, Editors, "Information Systems Curriculum Recommendations for the 80's: Undergraduate and Graduate Programs:, Nov. 1982, Communications of the ACM, Vol. No. 11.

Figure 3. General Structure of Information Systems Curriculum (ACM)

for the receiver to forward the study instrument and the cover letter to the database manager/administrator or DP manager in charge of the organizations database. The cover letter was placed on Oklahoma State University stationery and co-signed by Dr. Herbert M. Jelley, doctoral dissertation committee chairman.

The original mailing was sent. Six weeks later a follow-up letter, a copy of the study instrument, and a stamped, self-addressed return envelope were sent to all non-respondents. The follow-up letter was placed on Oklahoma State University stationery and co-signed by Dr. Jelley.

The time and location for mailing of the original and follow-up materials include the following:

1. Original mailing - August 10, 1983
   Location - Stillwater, Oklahoma
   Date requested for return - September 1, 1983

2. Follow-up mailing - September 1, 1983
   Location - Emporia, Kansas
   Date requested for return - September 21, 1983

Replies were received from 139 of the 465 organizations contacted, a 30 percent response. The percentage of returns and non-returns are reported in Table I.

Statistical Analysis of the Questionnaire Responses

The responses gathered from the study instrument were coded and transformed into a computer readable form using an IBM 129 keypunch machine.

To fulfill certain purposes of the study, a SPSS-X (Statistical Package for the Social Sciences) program was used to reveal frequencies

TABLE I

THE DISTRIBUTION OF THE STUDY POPULATION BY RETURNS AND NON-RETURNS TO THE QUESTIONNAIRE

Category	Number		
Total organization in population	465	100.0	
Total organizations believed to have been contacted	465	100.0	100.0
Total returns from the first mailing	110	23.7	23.7
Total returns from the follow-up mailing	29	6.3	6.3
Total respondents	139	30.0	30.0
Total non-respondents	326	70.0	70.0

and the percentage of each response included in the questionnaire which was not an open-ended question. Open-ended questions were processed and tablulated by the researcher.

Further analysis was conducted using the SPSS-X program to reveal percentage relationships and/or associations between the database managers educational background and database course subject area responses, database managers work experience and database course subject area responses, number of employees directly supervised by database managers and the type of DBMS (Database Management System) used, and other relevant information. The comparisons were analyzed using tables and the chi-square test for significance.

The study instrument is included in the appendix to aid readers in the interpretation of the data (see Appendix A).

The questionnaire is divided into three major areas. The procedures used to study each part of the questionnaire are discussed first, followed by an explanation of the way responses were treated in the data analysis stage.

Database Manager/Administrator or DP Manager (Personal Information)

The first section of the questionnaire deals with the personal information of the database manager/administrator. The responses were analyzed using frequency tables and percentages to ascertain the educational and work experience backgrounds of the database managers. Most items included the designation of "other" and provided space for any additional comments. These findings are reported in separate tables with responses and percentage frequencies included.

Responses to question 6 regarding work experience were divided into two parts: job designations, and years of experience. Most respondents listed more than one job description, and many respondents listed simultaneous years for the response concerning number of years experience. The sub-divisions were used for comparison with other selected items included in the questionnaire.

Database Course Subject Area

The second part of the questionnaire dealt with database managers opinions of the DPMA (Data Processing Management Association) and ACM (Association for Computing Machinery) model curriculums pertaining to database management/concepts course topics. This section was analyzed using frequency tables and response percentages to ascertain the managers opinions about what topics should be taught in a college database course. Responses to selected items in this section were also cross-tabulated with the respondents personal information.

Database System Configuration

The third part of the questionnaire included questions dealing with the status and trends of the database system in use at the respondent's organization. Certain items were tabulated by computer and the open-ended questions were tabulated by hand. An attempt was made to ascertain trends.

Tabulations and two-way tables using the chi-square test for significance were used to compare selected items from the completed questionnaires.

Using the SPSS-X statistical program at Oklahoma State University,

and researcher hand analysis of open-ended questions, the responses were analyzed as described.

Conclusions drawn in this study use the statistical results obtained from questionnaire response analysis.

Summary

This chapter describes the research design and procedures used in the study. Also presented are the ACM and DPMA model curriculums used to help develop a portion of the questionnaire. The questionnaire was sent to the respondents using an original mailing to the selected population of database organizations listed in the current Directory of Online Databases. A follow-up mailing was sent to all non-respondents. Several steps were taken to get the best response rate possible. These steps were: the use of a well constructed questionnaire, selection of an appropriate sample, development of a clear and concise cover letter, and a follow-up of non-respondents. The steps have resulted in a better than average return for this type of national study.

The questionnaire, the study population, and the procedures used to collect data were described. The chapter concludes with an explanation of statistical procedures utilized to analyze data from the study instrument.

Chapter IV deals with the analysis of the collected data for this study.

Program

Chapter IV

ANALYSIS OF DATA

The data gathered from the questionnaire sent to selected companies listed in the third issue of volume 4 of the Directory of Online Databases focused on database manager opinions about the DPMA and ACM suggested course topics of database courses at the undergraduate level. Data was obtained from the respondents regarding the following: the educational backgrounds and work histories of database managers, an in-depth study of the database management course, and the configuration of database systems used. The findings are presented using detailed analysis of the responses gathered from the questionnaire.

Plan for Analyzing the Gathered Data

Section I of the study instrument was planned to obtain responses from database managers regarding their educational and technical backgrounds. The items in this section were chosen through reveiw of related literature, review of other research questionnaires concerned with information systems, a pilot study sent to database managers in the Oklahoma region, and interviews and consultations with Oklahoma State University and Emporia State University faculty members. Allowances for "other" responses were made in the questionnaire.

Section II of the study instrument included the database topic areas recommended by the DPMA Educational Model Curriculum, database

topic areas recommended by the ACM Model Curriculum, database manager opinions of these topics, and respondents familiarity with the DPMA or ACM Model. Completed only by database managers with the technical expertise to do so, Sections II and III were designed to obtain responses regarding the course topics, and the database configuration.

A Statistical Package for the Social Sciences (SPSS-X) program was utilized to tabulate the answers to the question in the study instrument. The results from each item were tabulated using frequency of occurrence, accumulative frequency, percentage, and accumulative percentage.

Two-way tables were used to compare the managers' personal information with the results of Section II and selected questions in Section III.

The complete results of these findings may be seen in Appendix C and in the various tables in the following discussion.

Analysis of Gathered Data

Responses were received from business organizations using databases in 37 states throughout the United States. The analysis of the data received is split into four sections: the analysis of the educational and work backgrounds of the respondents, an analysis of the database topics managers believe should be taught at the undergraduate level, database configurations employed at the various respondent organizations, and relational comparisons of selected items included in the study instrument.

The section dealing with the database manager's educational and work background was sub-divided into six areas: amount of time spent

in current position, educational background, highest degree held, number of employees directly supervised, membership in data processing professional organizations, and work experience. The work experience area was subdivided into position title and years worked at each position. Most respondents had experience in more than one position. Many respondents answered the number of years experience part with concurrent figures. Each subdivision was analyzed using frequencies and the resultant percentages.

Section II, the database course content area, was subdivided into six major parts: course topics recommended by both curriculums (IIA.), course topics recommended by ACM only (IIB.), course topics recommended by DPMA only (IIC.), the part (IIA, B, or C) most closely approximating the knowledge needed by database employees, the extent of familiarity with the two model curriculums, and additional suggested topics. Part IIA. was subdivided further into ten areas: overview, applied data structures, hierarchical data model, network data model, relational data model, database administration, managing and defining the data environment, role of the database information system, relational systems and databases, and the use and management of databases. Part IIB. was subdivided into twelve areas: basic technical concepts for data, systems resources for data, basic machine architecture, searching and sorting techniques, operating systems topics, dynamic storage management, DBMS, integrated databases, memory management, use of high level-user oriented data languages, DBMS evaluation and distributed databases. Part IIC. was subdivided into five areas: storage device characteristics and physical input/output, indexed organized files, direct file organization, data model overview, and character codes.

Section III, the database system was subdivided into six areas: DBMS used, system changes, data organization model used, security measures employed, mainframe configuration, and additional hardware used by the DBMS.

Finally, various items in the study were compared using two-way tables and the chi-square test for significance. Personal information about respondents questions 1, 2, 3, 4, and 5 were compared to topic responses in Section II. Question 4, Part I was compared to DBMS used in Section III. Question 3, Part III was compared with Question 4, Part III. (Data organization type was compared with security measures used.)

Analysis of Database Manager Educational and Work Experience

The following section presents responses dealing with the educational and work backgrounds of the respondents. Space was provided on the questionnaire for "other" responses. Manager responses are included in the following discussion.

The database manager/administrator or DP manager (Personal Information) section included six questions. (See Appendix A for complete questions.) For brevity, each question has been abbreviated before being used in a table. Items in the questionnaire are first presented followed by the number of responses and analysis of the data.

Respondents were asked to indicate the number of years in their current position (DB manager/administrator or DP manager). As presented in Table II, 21 respondents, or 15.1 percent, indicated they had held their present position for less than one year, while 34 respondents, or

TABLE II

DATABASE MANAGER/ADMINISTRATOR OR DP MANAGER
TIME PERIOD IN CURRENT POSITION

Time Period	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than 1 year	21	21	15.1	15.1
1-2 years	34	55	24.5	39.6
3-4 years	36	91	25.9	65.5
5-6 years	11	102	7.9	73.4
More than 6 years	37	139	26.6	100.0

24.5 percent, had held their present position for one to two years. Thirty-six respondents, or 25.9 percent, have been in a database manager or DP manager position for three to four years. Eleven managers, or 7.9 percent, answered five to six years, and 37 managers, or 26.6 percent, had held this position for more than six years.

Table III contains the analysis of the respondents' educational backgrounds. Twenty, of 14.4 percent, of the respondents indicated their educational background included computer science. Twenty, or 14.4 percent, responded with mathematics as their educational background area. Thirteen, or 9.4 percent, were engineers; ten, or 7.2 percent, were computer information systems managers; five, or 3.6 percent were information systems degree holders; five, or 3.6 percent, were management science graduates.

Sixty-six, or 47.5 percent, of the respondents reported that they had educational backgrounds other than those listed on the questionnaire. Educational backgrounds listed by those who chose to specify, are summarized in Table IV.

It is interesting to note that 13 respondents, or 2.2 percent, have an educational background in library science. Even more interesting are the nine respondents who have chemistry backgrounds.

Table V contains an analysis of the educational level of the respondent. Fifty-five, or 39.6 percent, of the respondents indicated master's degree as their educational level. Forty-six, or 33.1 percent, or the database managers responding indicated having at least a Bachelor's degree. Sixteen, or 11.5 percent, of the respondents hold a Ph.D. or Ed.D. Twelve, or 8.6 percent, of the database managers have some college work. Four, or 2.9 percent, have an associate degree.

TABLE III

RESPONDENTS EDUCATIONAL BACKGROUNDS

Educational Discipline	Frequency	Cum. Freq.	Percent	Cum. Percent
Computer Science	20	20	14.4	14.4
Information Systems (C.S.)	5	25	3.6	18.0
Computer Information Systems (BUS.)	10	35	7.2	25.2
Management Science/ Organizational Research	5	40	3.6	28.8
Mathematics	20	60	14.4	43.2
Engineer	13	73	9.4	52.5
Other	66	139	47.5	100.0

TABLE IV

EDUCATIONAL DISCIPLINES THAT WERE NOT LISTED
ON THE QUESTIONNAIRE BUT SPECIFIED
UNDER "OTHER"

Educational Discipline	Frequency
Library/Information Science	13
Chemistry	9
Managment/Business Administration	8
Economics	4
English	3
Psychology	3
Physical Science	3
Physics	2
Journalism	2
Biology	2
History	2
Agriculture	1
Demography	1
Finance	1
Languages	1
Business School	1
Geology/Hydrogeology	1
Accounting	1
J.D.	1
M.D.	1
Political Science	1
Urban Planning	1
Education	1
Art Education	1
Family Social Science	1
Industrial Administration	1
Social Science	1
Liberal Arts	1

TABLE V

RESPONDENTS HIGHEST EDUCATIONAL LEVEL

Level Obtained	Frequency	Cum. Freq.	Percent	Cum. Percent
Ph.D. or Ed.D.	16	16	11.5	11.5
Master's Degree	55	71	39.6	51.1
Bachelor's Degree	46	117	33.1	84.2
Associate Degree	4	121	2.9	87.1
Some College Work	12	133	8.6	95.7
High School	1	134	0.7	96.4
Other	5	139	3.6	100.0

One, or 0.7 percent, has a high school education. Five, or 3.6 percent, reported they had an educational level other than those listed on the questionnaire.

Table VI contains a listing of the number of employees the database manager supervises directly. Fifty-two, or 37.4 percent respondents, indicated they supervised one to five employees directly. This is rather significant because it tends to give an impression that database managers do not supervise the overall operations of the organization but just a small, discrete part of the total business situation. However, 23 respondents, or 16.5 percent, stated they supervise over 20 workers directly. Twenty-two managers, or 15.8 percent, supervise six to 10 employees; 16 respondents, or 11.5 percent, supervise no one directly; 15 managers, or 10.8 percent, supervise 11 to 15 employees; while 11 respondents, or 7.9 percent, supervise from 16 to 20 employees. Large databases exist, but the majority of them are small.

Table VII represents membership in professional data processing organizations. Eighty-two respondents, or 59.0 percent, belonged to no professional organizations. Four, or 2.9 percent, belong to the DPMA; six, or 4.3 percent, belong to ACM; five, or 3.6 percent belong to DPMA and another organization; six, or 4.3 percent, belong to ACM and another organization; one, or 0.7 percent, belongs to both ACM and DPMA; seven, or 5.0 percent, did not answer. Twenty-eight respondents, or 20.1 percent belong to other organizations not listed on the questionnaire. The other organizations are listed by frequency of occurrence from the most to the least in Table VIII.

Work experience was subdivided into five groups: 1-5 years, 6-10 years, 11-15 years, 16-20 years, and over 20 years. Table IX contains a list of the work areas in which respondents have experience. Of the

TABLE VI

EMPLOYEES DIRECTLY SUPERVISED BY DB MANAGERS

Number of Employees Supervised	Frequency	Cum. Freq.	Percent	Cum. Percent
None	16	16	11.5	11.5
1 - 5	52	68	37.4	48.9
6 - 10	22	90	15.8	64.7
11 - 15	15	105	10.8	75.5
16 - 20	11	116	7.9	83.5
More than 20	23	139	16.5	100.0

TABLE VII

MANAGER'S MEMBERSHIP IN PROFESSIONAL
DATA PROCESSING ORGANIZATIONS

Organization	Frequency	Cum. Freq.	Percent	Cum. Percent
DPMA	4	4	3.0	3.0
ACM	6	10	4.5	7.5
SDE	0	10	0.0	7.5
DPMA and Other	5	15	3.8	11.3
ACM and Other	6	21	4.5	15.8
DPMA and ACM	1	22	0.9	16.7
Other	28	50	21.2	37.9
None	82	132	62.1	100.0
Did not respond	7	139	----	-----

TABLE VIII

PROFESSIONAL DATA PROCESSING ORGANIZATIONS
NOT LISTED ON THE QUESTIONNAIRE BUT
SPECIFIED UNDER "OTHER"

DP Organization	Frequency
ASIS (American Society for Information Science)	15
IEEE	6
Association for Women in Computing	3
ASM	2
SLA	2
ASIDIC	2
AIM	2
EDPAA	1
National Bureau of Standards	1
SIM	1
SIAM	1
Software AG User Group	1
IAA	1
Michigan Database User Group	1
ARMA	1
APDU	1
TUUA	1
GUIDE/SHARE	1
IASSIST	1

TABLE IX

WORK EXPERIENCE - POSITION TITLE AND YEARS EXPERIENCE

Position Title	Frequency	Cum. Freq.	Percent	Cum. Percent
Application Programmer or Programmer/Analyst				
1-5 years	48	48	34.5	34.5
6-10 years	18	66	12.9	47.4
11-15 years	12	78	8.6	56.0
16-20 years	1	79	0.7	56.7
More than 20 years	1	80	0.7	57.4
NONE	59	139	42.6	100.0
Information System Specialist				
1-5 years	25	25	18.0	18.0
6-10 years	13	38	9.3	27.3
11-15 years	4	42	2.8	30.1
16-20 years	2	44	1.5	31.6
More than 20 years	3	47	2.2	33.8
NONE	92	139	66.2	100.0
Systems Analyst/Systems Engineer				
1-5 years	30	30	21.6	21.6
6-10 years	15	45	10.8	32.4
11-15 years	4	49	2.9	35.3
16-20 years	2	51	1.4	36.7
More than 20 years	1	52	0.7	37.4
NONE	87	139	62.6	100.0
Database Administrator Manager				
1-5 years	62	62	44.6	44.6
6-10 years	22	84	15.8	60.4
11-15 years	3	87	2.2	62.6
16-20 years	2	89	1.5	64.1
More than 20 years	0	89	0.0	64.1
NONE	50	139	35.9	100.0

TABLE IX (Continued)

Position Title	Frequency	Cum. Freq.	Percent	Cum. Percent
Finance				
1-5 years	10	10	7.2	7.2
6-10 years	4	14	2.9	10.1
11-15 years	0	14	0.0	10.1
16-20 years	0	14	0.0	10.1
More than 20 years	1	15	0.7	10.8
NONE	124	139	89.2	100.0
Marketing				
1-5 years	27	27	19.4	19.4
6-10 years	11	38	7.9	27.3
11-15 years	3	41	2.2	29.5
16-20 years	0	41	0.0	29.5
More than 20 years	3	44	2.2	31.7
NONE	95	139	68.3	100.0
Management				
1-5 years	33	33	23.7	23.7
6-10 years	30	63	21.6	45.3
11-15 years	11	74	7.9	53.2
16-20 years	4	78	2.9	56.1
More than 20 years	6	84	4.3	60.4
NONE	55	139	39.6	100.0
Accounting				
1-5 years	10	10	7.2	7.2
6-10 years	2	12	1.45	8.65
11-15 years	2	14	1.45	10.1
16-20 years	0	14	0.0	10.1
More than 20 years	1	15	0.7	10.8
NONE	124	139	89.2	100.0

139 respondents, 48, or 34.5 percent, indicated they had from 1-5 years experience as a programmer. Eighteen respondents, or 12.9 percent, answered they had from 6-10 years experience. Twelve database managers, or 8.6 percent, indicated they had from 11-15 years experience as a programmer. One, or 0.7 percent, had 16-20 years experience. Fifty-nine managers, or 42.6 percent, had no programming experience. Eighty, or 57.4 percent of the respondents, had some experience as a programmer.

The tabulation of the Information Systems Specialist area resulted in the following data: Twenty-five managers, or 18.0 percent, indicated they had from 1-5 years experience. Thirteen respondents, or 9.3 percent, marked the questionnaire indicating they had 6-10 years experience as an Information Systems Specialist. Four managers, or 2.8 percent, indicated they had 11-15 years experience; two, or 1.5 percent had 16-20 years experience; three, or 2.2 percent, indicated they had over 20 years experience; and 97, or 66.2 percent, had no experience as an Information Systems Specialist. Forty-seven, or 33.8 percent of the respondents have some experience as an Information System Specialist.

Systems Analyst/Systems Engineer was the next job title respondents were asked to answer. Thirty, or 21.6 percent, of the database managers have from 1-5 years experience as Systems Analysts. Fifteen managers, or 10.8 percent, indicated they had from 6-10 years experience. Four respondents, or 2.9 percent, have from 11-15 years experience as Systems Analysts. Two, or 1.4 percent of the respondents, have 16-20 years experience; one respondent, or 0.7 percent, has over 20 years experience. Eighty-seven, or 62.6 percent, have no experience. Fifty-two, or 37.4 percent of the respondents, have some experience as a Systems Analyst.

The tabulation of the Database Administrator/Manager area resulted in the following data: Sixty-two, or 44.6 percent, indicate they have from 1-5 years experience. Twenty-two, or 15.8 percent, answered they have from 6-10 years experience. Three managers, or 2.2 percent, indicate they have 11-15 years experience; two, or 1.5 percent, have 16-20 years experience. Fifty, or 35.9 percent, have no formal database manager experience. Eighty-nine, or 64.1 percent of the respondents, have some experience as a database manager.

The following figures indicate the number of respondents with experience in finance. Ten managers, or 7.2 percent, indicate they have from 1-5 years experience. Four managers, or 2.9 percent, have 6-10 years experience; one, or 0.7 percent, has over 20 years experience; 124 respondents had no financial work experience. Fifteen, or 10.8 percent of the respondents, indicate they had formal finance work experience.

The tabulation of the Marketing area resulted in the following data: Twenty-seven, or 19.4 percent, indicate they have from 1-5 years experience. Eleven, or 7.9 percent, have from 6-10 years experience. Three managers, or 2.2 percent, indicate they have been in marketing for 11-15 years. Three respondents, or 2.2 percent, have over 20 years experience. Ninety-five, or 68.3 percent, have no formal marketing work experience. Forty-four, or 31.7 percent of the respondents have some experience in marketing.

The following figures indicate the number of respondents with experience in management. Thirty-three, or 23.7 percent, indicate they have from 1-5 years experience. Thirty respondents, or 21.6 percent, have 6-10 years experience; eleven, or 7.9 percent, have 11-15 years

experience; four managers, or 2.9 percent, have 16-20 years experience; six respondents, or 4.3 percent, have over 20 years experience. Fifty-five respondents, or 39.6 percent have not had formal management work experience. Eighty-four, or 60.4 percent of the respondents, have some experience in management.

The tabulation of the final formal work experience area, accounting, resulted in the following data: Ten, or 7.2 percent, indicate 1-5 years experience. Two, or 1.5 percent, had 6-10 years experience. Two managers, or 1.5 percent, indicate they have worked in accounting for 11-15 years. One respondent, or 0.7 percent has over 20 years of accounting experience. One hundred and twenty-four, or 89.2 percent, have no formal accounting work experience. Fifteen, or 10.8 percent of the respondents, have some experience in accounting.

It is interesting to note that over 34 percent of the respondents have formal work experience as application programmers and 19.4 percent have formal marketing experience. It is also interesting to note that only 44.6 percent of the respondents consider themselves to have actual database management experience.

Twenty-five respondents, or slightly less than 18 percent of the total respondents, reported they had work experience in other areas not listed on the questionnaire. Other work experience areas listed by those who specified an area are summarized in Table X.

An Analysis of Database Manager Opinions Dealing with Database Management Topics Suggested by the DPMA and ACM Model Curriculum

The second part of the questionnaire covered database manager

TABLE X

WORK EXPERIENCE AREAS THAT WERE NOT LISTED ON THE QUESTIONNAIRE BUT ANSWERED UNDER "OTHER"

Work Experience Area	Frequency
Publisher	4
Education	4
Indexer	2
Librarian	1
Psychology	1
Abstracting	1
Technical Writing	1
Manufacturing	1
Database Producer	1
Technical Consultant	1
Industry Expert	1
Systems Programmer	1
Computer Operations	1
Administration	1
Research Scientist	1
Training	1
Engineering	1
Operations	1

opinions of the model curriculums recommended database course topics and was designed to elicit responses to the following questions: (1) What model curriculum, if any, do actual database managers prefer? (2) How important do database managers believe each topic actually is?

Table XI presents the findings concerning the respondents opinions of the database course topics recommended by both curriculums (ACM and DPMA). Managers were asked to respond to each subject by answering very important, important, average importance, unimportant, or very unimportant.

The responses were analyzed using a five-point Likert Scale. Frequencies, cumulative frequencies, percentages, and cumulative percentages were analyzed for each topic. A column also exists to indicate no response.

The database course subject area included six questions. (See Appendix A for complete questions.) The first three questions were subdivided into 10 parts (IIA), 12 parts (IIB), and 5 parts (IIC), respectively. The other three questions were not subdivided, and standard frequency and percentage analysis were performed.

Section IIA presented database topics from both model curriculums. Respondents were queried about how they felt about each database topic. When queried about the first topic, overview, the following results were obtained: 55, or 46.3 percent of the managers giving responses, indicate they consider overview to be a very important topic to be used in a database management course; 33, or 27.7 percent, believe the topic is important; 28, or 23.5 percent, believe the topic is of average importance; one manager, or 0.8 percent, thinks the topic is unimportant,

TABLE XI

DATABASE MANAGER RESPONSES TO TOPICS
RECOMMENDED BY THE ACM AND
DPMA MODEL CURRICULUMS

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Overview				
1. Very Important	55	55	46.3	46.3
2. Important	33	88	27.7	74.0
3. Average Importance	28	116	23.5	97.5
4. Unimportant	1	117	0.8	98.3
5. Very Unimportant	2	119	1.7	100.0
6. NO RESPONSE	20	139	----	-----
Applied Data Structures				
1. Very Important	20	20	18.9	18.9
2. Important	39	59	36.8	55.7
3. Average Importance	35	94	33.0	88.7
4. Unimportant	9	103	8.5	97.2
5. Very Unimportant	3	106	2.8	100.0
6. NO RESPONSE	33	139	----	-----
Hierarchical Data Model				
1. Very Important	9	9	8.1	8.1
2. Important	40	49	36.1	44.2
3. Average Importance	49	98	44.1	88.3
4. Unimportant	9	107	8.1	96.4
5. Very Unimportant	4	111	3.6	100.0
6. NO RESPONSE	28	139	----	-----
Network Data Model				
1. Very Important	10	10	9.0	9.0
2. Important	32	42	28.8	37.8
3. Average Importance	56	98	50.5	88.3
4. Unimportant	10	108	9.0	97.3
5. Very Unimportant	3	111	2.7	100.0
6. NO RESPONSE	28	139	----	-----

TABLE XI (Continued)

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Relational Data Model				
1. Very Important	18	18	15.8	15.8
2. Important	35	53	30.7	46.5
3. Average Importance	48	101	42.1	88.6
4. Unimportant	9	110	7.9	96.5
5. Very Unimportant	4	114	3.5	100.0
6. NO RESPONSE	25	139	----	-----
Database Administration				
1. Very Important	40	40	35.7	35.7
2. Important	41	81	36.6	72.3
3. Average Importance	24	105	21.4	93.7
4. Unimportant	5	110	4.5	98.2
5. Very Unimportant	2	112	1.8	100.0
6. NO RESPONSE	27	139	----	-----
Data Environment, Managing and Defining Data				
1. Very Important	48	48	42.9	42.9
2. Important	32	80	28.6	71.5
3. Average Importance	22	102	19.6	91.1
4. Unimportant	6	108	5.4	96.5
5. Very Unimportant	4	112	3.5	100.0
6. NO RESPONSE	27	139	----	-----
Role of Database Information System				
1. Very Important	37	37	32.2	32.2
2. Important	34	71	29.6	61.8
3. Average Importance	35	106	30.4	92.2
4. Unimportant	6	112	5.2	97.4
5. Very Unimportant	3	115	2.6	100.0
6. NO RESPONSE	24	139	----	-----

TABLE XI (Continued)

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Relational Systems, Relational Databases				
1. Very Important	23	23	20.5	20.5
2. Important	40	63	35.7	56.2
3. Average Importance	43	106	38.4	94.6
4. Unimportant	4	110	3.6	98.2
5. Very Unimportant	2	112	1.8	100.0
6. NO RESPONSE	27	139	----	-----
Use and Management of Databases				
1. Very Important	67	67	57.3	57.3
2. Important	31	98	26.5	83.8
3. Average Importance	15	113	12.5	96.6
4. Unimportant	2	115	1.7	98.3
5. Very Unimportant	2	117	1.7	100.0
6. NO RESPONSE	22	139	----	-----

Two respondents, or 1.7 percent, believe the topic is very important. Twenty respondents had no opinion on this topic.

It is interesting to note that just under 75 percent of the responding managers believe an overview is an important to very important topic for a database management course.

The second topic deals with applied data structures. When queried about this topic, database managers supplied the following data: 20, or 18.9 percent of the responding managers, state this topic is very important; 39, or 36.8 percent, believe the topic is important; 35, or 33.0 percent, give it average importance. In nine managers opinions, or 8.5 percent, the topic is considered to be of no importance. Three respondents, or 2.8 percent, believe the topic is very unimportant. Thirty-three respondents had no opinion about this topic.

It is interesting to note that just over 55 percent of the responding managers believe applied data structures is important to very important. Almost ninety percent state this topic has importance.

The third topic is the hierarchical data model. When asked to respond to this topic, database managers answered with the following data: nine, or 8.1 percent of the responding managers, indicate this topic is very important; 40, or 36.1 percent, indicate the topic is important; 49, or 44.1 percent, give the topic an average importance; nine, or 8.1 percent, state the topic is unimportant. Four, or 3.6 percent, indicate the topic is very unimportant. Twenty-eight managers had no opinion on this topic.

It is interesting to note that close to 90 percent of the responding managers believe this topic is of average importance or more.

The fourth topic deals with the network data model. Database

managers responded with the following data: 10 respondents, or 9.0 percent, state this topic is very important; 32, or 28.8 percent, give this topic an important rating; while 56, or 50.5 percent, believe this topic is of average importance. Ten, or 9.0 percent, believe the topic unimportant. Three respondents, or 2.7 percent, believe the topic is very unimportant. Twenty-eight managers had no opinion.

Once again, it is interesting to note that over 88 percent of the responding managers give this topic a positive vote.

Topic number five deals with the relational data model, not to be confused with relational database systems. They relate, but one builds on the other. The following data was obtained: 18, or 15.8 percent of the responding managers, give this topic a very important rating; 35, or 30.7 percent, believe the topic is important; while 48, or 42.1 percent, give the topic an average importance rating. Nine respondents, or 7.9 percent, believe the topic is unimportant; and four managers, or 3.5 percent, believe this topic is very unimportant. Twenty-five managers gave no response to this question.

Close to 90 percent of the responding managers reacted to the topic in a positive manner.

Topic six is database administration. The statistical analysis resulted in the following: 40, or 35.7 percent, contend that database administration is a very important topic. Forty-one, or 36.6 percent, believe the topic to be important while twenty-four, or 21.4 percent, give the topic an average importance rating. Five managers, or 4.5 percent, believe the topic is unimportant; while two, or 1.8 percent, think database administration is very unimportant. Twenty-seven managers had no opinion.

It is interesting to note that nearly 94 percent of the responding managers gave the topic a positive rating.

Topic seven deals with the data environment and managing data. The following data was obtained: 48, or 42.9 percent, state this topic is very important. Thirty-two, or 28.6 percent, believe the topic is important; while 22, or 19.6 percent, give the topic an average importance. Six respondents, or 5.4 percent, believe the topic is unimportant; and four respondents, or 3.5 percent, give the topic a very unimportant rating. Twenty-seven of the questionnaire respondents had no opinion.

Nearly 92 percent of the respondents reacted to the seventh topic positively.

The eighth topic is the role of the database information system. Analyzing the data resulted in the following: Thirty-seven, or 32.2 percent of the responding managers, contend that this topic is very important; 34, or 29.6 percent, believe the topic is important; 35, or 30.4 percent, give this topic an average importance rating. Six respondents, or 5.2 percent, believe the topic is unimportant; while three, or 2.6 percent, contend that this topic is very unimportant. Twenty-four managers had no opinion.

It is interesting to note that over 92 percent of the responding managers gave this topic a rating of average to very important.

Topic nine deals with the importance of relational systems-relational databases as a course topic. The data indicates the following: 23, or 20.5 percent of the respondents, state this topic is very important. Forty, or 35.7 percent, believe the topic is important; while forty-three, or 38.4 percent, give the topic an average importance

rating. Four, or 3.6 percent, state the topic is not important; while two respondents, or 1.8 percent, believe this topic is very unimportant. Twenty-seven managers had no opinion.

It is interesting to note that nearly 95 percent of the responding managers give this topic a positive importance rating.

The final topic in Section IIA deals with the use and management of databases. The following data was obtained: 67, or 57.3 percent, believe this topic is very important. Thirty-one, or 26.5 percent, give this topic an important rating; while 15, or 12.8 percent, give this topic a rating of average importance. Two respondents, or 1.7 percent, think this topic is unimportant; while two, or 1.7 percent, believe this topic is very unimportant. Twenty-two managers had no opinion.

It is especially interesting to note that over 57 percent of the responding managers give this topic the highest rating. It is also interesting to note that 96.6 percent give this topic a positive rating.

Table XII presents the statistical analysis concerning the managers' opinions of the the database course topics recommended only by the ACM. The same scheme of asking managers to rate each topic using very important, important, average importance, unimportant, and very unimportant is used.

The same five-point Likert Scale is used. Frequencies, cumulative frequencies, percentages and cumulative percentages were analyzed for all twelve topics. A column in the table also indicates the number of managers who gave no response.

TABLE XII

DATABASE MANAGER RESPONSES TO TOPICS
RECOMMENDED ONLY BY THE ACM
MODEL CURRICULUM

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Basic Tech. Concepts for Data				
1. Very Important	24	24	21.4	21.4
2. Important	34	58	30.4	51.8
3. Average Importance	51	109	45.5	97.3
4. Unimportant	3	112	2.7	100.0
5. Very Unimportant	0	112	0.0	100.0
6. NO RESPONSE	27	139	----	-----
Systems Resources for Data				
1. Very Important	9	9	8.0	8.0
2. Important	42	51	37.5	45.5
3. Average Importance	55	106	49.1	94.6
4. Unimportant	5	111	4.5	99.1
5. Very Unimportant	1	112	0.9	100.0
6. NO RESPONSE	27	139	----	-----
Basic Machine Architecture				
1. Very Important	4	4	3.5	3.5
2. Important	16	20	14.1	17.6
3. Average Importance	56	76	49.1	66.7
4. Unimportant	34	110	29.8	96.5
5. Very Unimportant	4	114	3.5	100.0
6. NO RESPONSE	25	139	----	-----
Searching and Sorting Tech.				
1. Very Important	15	15	13.1	13.1
2. Important	38	53	33.1	46.2
3. Average Importance	52	105	45.2	91.4
4. Unimportant	8	113	6.9	98.3
5. Very Unimportant	2	115	1.7	100.0
6. NO RESPONSE	24	139	----	-----

TABLE XII (Continued)

Course Topic	Frequency	Cum. Feeq.	Percent	Cum. Percent
Operating System Topics				
1. Very Important	6	6	5.3	5.3
2. Important	25	31	22.1	27.4
3. Average Importance	61	92	54.0	81.4
4. Unimportant	18	110	15.9	97.3
5. Very Unimportant	3	113	2.7	100.0
6. NO RESPONSE	26	139	----	-----
Dynamic Storage Management				
1. Very Important	7	7	6.4	6.4
2. Important	25	32	22.9	29.3
3. Average Importance	56	88	51.3	80.6
4. Unimportant	10	107	17.3	97.9
5. Very Unimportant	2	109	2.1	100.0
6. NO RESPONSE	30	139	----	-----
Database Management System				
1. Very Important	26	26	23.6	23.6
2. Important	46	72	41.8	65.4
3. Average Importance	35	107	31.8	97.2
4. Unimportant	0	107	0.0	97.2
5. Very Unimportant	3	110	2.8	100.0
6. NO RESPONSE	29	139	----	-----
Integrated Databases				
1. Very Important	24	24	21.8	21.8
2. Important	46	70	41.8	63.6
3. Average Importance	33	103	30.0	93.6
4. Unimportant	3	106	2.7	96.3
5. Very Unimportant	4	110	3.7	100.0
6. NO RESPONSE	29	139	----	-----
Memory Management				
1. Very Important	6	6	5.35	5.35
2. Important	18	24	15.9	21.25
3. Average Importance	57	81	50.4	71.65
4. Unimportant	26	107	23.0	94.65
5. Very Unimportant	6	113	5.35	100.0

TABLE XII (Continued)

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Use of High Level, User Oreinted Data Languages				
1. Very Important	32	32	28.1	28.1
2. Important	30	62	26.3	54.4
3. Average Importance	37	99	32.5	86.9
4. Unimportant	13	112	11.4	98.3
5. Very Unimportant	2	114	1.7	100.0
6. NO RESPONSE	25	139	----	-----
DBMS Evaluation				
1. Very Important	28	28	25.5	25.5
2. Important	39	67	35.5	61.0
3. Average Importance	37	104	33.6	94.6
4. Unimportant	3	107	2.7	97.3
5. Very Unimportant	3	110	2.7	100.0
6. NO RESPONSE	29	139	----	-----
Distributed Databases				
1. Very Important	24	24	21.8	21.8
2. Important	33	57	30.0	51.8
3. Average Importance	46	103	41.8	93.6
4. Unimportant	3	106	3.2	96.8
5. Very Unimportant	3	109	3.2	100.0
6. NO RESPONSE	30	139	----	-----

An Analysis of Database Manager Opinions Dealing with Database Management Topics Suggested only by the ACM Model Curriculum

Question II.B, on the questionnaire deals with course topics suggested by the ACM Model Curriculum. Respondents were queried on how they felt about each database topic. When queried about the first topic, basic technical concepts for data, the following results were obtained: 24, or 21.4 percent of the managers giving responses, indicate this topic is very important. Thirty-four, or 30.4 percent of the respondents, believe the topic is important; 51, or 45.5 percent, contend the topic is of average importance; three respondents, or 2.7 percent, believe the topic is unimportant. No one feels the topic is very unimportant. Twenty-seven respondents had no opinion on this topic.

It is important to note that just over 50 percent of the responding managers believe this topic is important to very important. More than 90 percent of the respondents give this topic a positive rating.

The second topic deals with systems resources for data. When queried about this topic, database managers supplied the following data: nine, or 8.0 percent of the responding managers, state this topic is very important; 42, or 37.5 percent, believe the topic is important; 55, or 49.1 percent, give this topic a rating of average importance; five managers, or 4.5 percent, consider the topic to be unimportant; while one respondent, or 0.9 percent, believe the topic is very unimportant. Twenty-seven respondents had no opinion about systems resources for data.

The third topic covers basic machine architecture. Managers responded to this topic with the following data: four, or 3.5 percent of the responding managers, indicate this topic is very important; 16, or 14.1 percent, believe this topic is important; 56, or 49.1 percent, believe this topic is of average importance. Thirty-four, or 29.8 percent, contend this topic is unimportant; while four respondents, or 3.5 percent, feel this topic is very unimportant. Twenty-five respondents had no opinion.

The fourth topic deals with searching and sorting techniques. Statistical analysis revealed the following: 15, or 13.1 percent of the responding managers, contend this topic is very important; while 38, or 33.1 percent, state the topic is important. Fifty-two, or 45.2 percent, think this topic is of average importance; eight, or 6.9 percent, believe the topic is unimportant; while two, or 1.7 percent, believe searching and sorting techniques rank a very unimportant rating. Twenty-four managers ventured no opinion on this topic.

Note that over 46 percent of the respondents give this topic a rating of important to very important.

Topic 5, in part II.b., deals with operating systems topics. The following data was obtained: six, or 5.3 percent, give this topic a very important rating; 25, or 22.1 percent, believe this topic is important; while 61, or 54.0 percent, give this topic an average importance ranking. Eighteen respondents, or 15.9 percent, state this topic is unimportant; while three managers, or 2.7 percent, believe operating systems is a very unimportant topic. Twenty-six respondents gave no opinion.

Only 25 respondents, or 27.4 percent, believe this topic is

important. Sixty-one, or 54.0 percent more, did give this topic a positive result. Favorable to average importance seems to be the consensus here.

Topic 6 is dynamic storage management. The following data was collected: seven, or 6.4 percent, state this topic is very important; 25, or 22.9 percent, believe this topic is important; while 56, or 51.3 percent, contend the topic is of average importance. Nineteen, or 17.3 percent, give the dynamic storage management topic an unimportant rating; two respondents, or 2.1 percent, give this topic a very unimportant ranking. Thirty managers had no opinion.

Once again, the majority of respondents (over 50 percent) believe this topic should receive an average importance ranking. The managers tend to be quite neutral on this particular topic.

Respondents were requested to indicate their preference on the next topic, topic 7, database management systems. The statistical study obtained the following data: Twenty-six, or 23.6 percent, give this topic a very important ranking; 46, or 41.8 percent, believe this topic is important; 35, or 31.8 percent, state this topic should have only an average importance ranking. No one responded to unimportant; while only three, or 2.8 percent of the respondents, thought this topic was very unimportant. Twenty-nine respondents had no opinion.

It is interesting to note, that about 65 percent of the responding managers believe this topic is important.

Topic 8, in part II.b., deals with integrated databases. Analysis reveals the following: 24, or 21.8 percent, give this topic a very important rating; 46, or 41.8 percent, give integrated databases an important ranking; while 33, or 30.0 percent, give this topic an average

importance rating. Three respondents, or 2.7 percent, believe this topic is unimportant; and four, or 3.7 percent, state integrated databases are very unimportant. Twenty-nine managers had no opinion.

Over 63 percent of the respondents believe this topic is important to very important.

Topic 9 is memory management. Statistical analysis obtained the following data: six respondents, or 5.35 percent, believe this topic is very important; 18, or 15.9 percent, contend that memory management is an important topic; while 57, or 50.4 percent, believe this topic is of average importance. Twenty-six, or 23.0 percent, believe this topic is unimportant; while six respondents believe this topic is very unimportant. Twenty-six managers had no opinion.

Only about 20 percent of the respondents gave memory management an important to very important rating. More than 28 percent of the managers felt this topic was not important.

The tenth topic in part II.b., of the study instrument, deals with the use of high-level, user-oriented data languages. The frequency and percentage analysis revealed the following data: 32, or 28.1 percent, beleive this topic is very important; 30 respondents, or 26.3 percent, contend this topic is important; 37, or 32.5 percent, state high-level, user-oriented data languages are of average importance. Thirteen, or 11.4 percent, believe the topic is unimportant; while two managers, or 1.7 percent, state this topic is very unimportant. Twenty-five respondents had no opinion.

Over 54 percent of the respondents contend this topic is important to very important. The respondents lean toward the positive on this particular database course topic.

The next topic analyzed is DBMS evaluation. The statistical analysis of the data reveals the following data: 28, or 25.5 percent of the respondents, state this topic is very important; 39, or 35.5 percent, believe this topic is important; 37, or 33.6 percent, contend this topic is average in importance. Three respondents, or 2.7 percent, give this topic an unimportant ranking; while three other respondents, or 2.7 percent, give this topic a very unimportant ranking. Twenty-nine managers had no opinion.

It is especially interesting to note, that 61.0 percent of the responding managers felt this was an important to very important topic.

The final topic in part II.b. deals with distributed databases. The following data was obtained: 24, or 21.8 percent, believe this topic is very important; 33, or 30.0 percent, state this topic is important; 46, or 41.8 percent, believe this topic should be given only an average importance ranking. Three respondents, or 3.2 percent, state this topic is unimportant; while three respondents, or 3.2 percent, believe this topic is very unimportant. Thirty respondents had no opinion.

Distributed databases appears to be another popular topic. Over 50 percent of the responding managers believe the topic is important to very important as a topic for a database management course.

Table XIII presents the statistical analysis concerning the managers' opinions of the database course topics recommended only by the Data Processing Management Association (DPMA). The same scheme of asking managers to rank each topic using very important, important, average importance, unimportant, and very unimportant is used.

The same five-point Likert Scale will be used. Frequencies,

TABLE XIII

DATABASE MANAGER RESPONSES TO TOPICS
RECOMMENDED ONLY BY THE DPMA
MODEL CURRICULUM

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Storage Device Characteristics and Physical Input/Output				
1. Very Important	19	19	16.4	16.4
2. Important	35	54	30.2	46.6
3. Average Importance	49	103	42.2	88.8
4. Unimportant	11	114	9.5	98.3
5. Very Unimportant	2	116	1.7	100.0
6. NO RESPONSE	23	139	----	-----
Indexed Organized Files				
1. Very Important	31	31	26.5	26.5
2. Important	35	66	29.9	56.4
3. Average Importance	42	108	35.9	92.3
4. Unimportant	7	115	6.0	98.3
5. Very Unimportant	2	117	1.7	100.0
6. NO RESPONSE	22	139	----	-----
Direct File Organization				
1. Very Important	27	27	23.3	23.3
2. Important	32	59	27.6	50.9
3. Average Importance	46	105	39.7	90.5
4. Unimportant	9	114	7.8	98.3
5. Very Unimportant	2	116	1.7	100.0
6. NO RESPONSE	23	139	----	-----
Data Model Overview DDL, DML				
1. Very Important	15	15	13.8	13.8
2. Important	38	53	34.9	48.6
3. Average Importance	47	100	43.1	43.1
4. Unimportant	7	107	6.4	98.2
5. Very Unimportant	2	109	1.8	100.0
6. NO RESPONSE	30	139	----	-----

TABLE XIII (Continued)

Course Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
Character Codes				
1. Very Important	6	6	5.5	5.5
2. Important	23	29	20.9	26.4
3. Average Importance	53	82	48.2	74.5
4. Unimportant	24	106	21.8	96.4
5. Very Unimportant	4	110	3.6	100.0
6. NO RESPONSE	29	139	----	-----

cumulative frequencies, percentages and cumulative percentages were analyzed for all five topics. A column is used to record the number of managers who have no opinion.

An Analysis of Database Manager Opinions Dealing with Database Management Topics Suggested only by the DPMA Model Curriculum

Five topics were included in Part IIC of the study instrument. As presented in Table XIII, the managers participating in this study supplied the following data: 19 respondents, or 16.4 percent, considered the topic storage device characteristics and physical input/output to be very important. Thirty-five, or 30.2 percent, gave this topic an important ranking; while 49, or 42.2 percent of the respondents, believe this topic is only of average importance. Eleven, or 9.5 percent, believe the topic is unimportant; and two managers, of 1.7 percent, give this topic a very unimportant rating. Twenty-three managers had no opinion.

Nearly 47 percent of the responding managers gave this topic an important to very important rating. However, more than 42 percent also gave this topic an average rating.

Topic 2, or part IIC, requested managers to give their opinions on indexed organized files. The statistical analysis revealed the following: 31, or 26.5 percent of the respondents, state this topic is very important; while 66, or 29.9 percent, believe this topic is important. Forty-two, or 35.9 percent, contend this topic is of average importance; seven, or 6.0 percent, think this topic is unimportant; and

two managers, or 1.7 percent, believe this topic is very unimportant. Twenty-two managers had no opinion.

It is especially interesting to note that over 56 percent of the responding managers believe indexed organized files deserve an important to very important ranking.

The next topic studied deals with direct file organization. The analysis revealed the following data: 27, or 23.3 percent, contend this is a very important topic; 32, or 27.6 percent, believe the topic is important; while 46, or 39.7 percent of the respondents, believe the topic should be given an average importance ranking. Nine respondents, or 7.8 percent, believe this topic is unimportant; while two, or 1.7 percent, give this topic a very unimportant ranking. Twenty-three managers had no opinion.

Over fifty percent of the responding managers gave this topic an important to very important ranking.

Topic 4 deals with data models and database language--specifically, the DDL (data manipulation language). The frequency and percentage analysis revealed the following: 15 respondents, or 13.8 percent, believe this topic is very important; 38, or 34.9 percent, contend this topic is important; while 47, or 43.1 percent, believe this topic is of average importance. Seven respondents, or 6.4 percent, believe this topic is unimportant; and two, or 1.8 percent, contend this topic is very unimportant. Thirty managers had no opinion.

It is interesting to note that nearly 50 percent of the responding managers felt this topic was important to very important.

The final topic in part IIC is character codes. The analysis of the data revealed the following: six respondents, or 5.5 percent,

believe this topic is very important; 23, or 20.9 percent, believe this topic is important; while 53, or 48.2 percent, contend this topic is of only average importance. Twenty-four, or 21.8 percent, believe this topic is unimportant; while four, or 3.6 percent, contend this topic is very unimportant. Twenty-nine managers had no opinion.

Almost as many managers disliked this topic as like it. The rating was about average.

An Analysis of Course Topics (Subject Blocks - IIA, IIB, IIC) that most Closely Approximates the Knowledge needed by Database Management Professionals

As presented in Table XIV, more than 55 percent of the respondents indicated they would recommend Block IIA and IIB (topics recommended by both models and topics recommended by ACM only). Only ten, or 8.5 percent, chose Block IIA and IIC (topics recommended by both models and topics recommended by the DPMA only). Fourteen respondents, or 11.9 percent, felt Block IIB and IIC (topics recommended by the ACM model only and topics recommended by the DPMA only) most closely approximated the knowledge needed by database professionals. Twenty-eight, or 23.7 percent, chose Block IIA, IIB, and IIC (topics recommended by both models, topics recommended by the ACM model only and topics recommended by the DPMA model only). Twenty-one managers gave no response.

Table XV presents the familiarity of respondents with the DPMA and ACM curriculum models. The statistical analysis revealed the following:

TABLE XIV

COURSE TOPICS (SUBJECT BLOCKS-II.A, II.B, II.C)
THAT MOST CLOSELY APPROXIMATES THE
KNOWLEDGE NEEDED BY
DATABASE MANAGEMENT
PROFESSIONALS

Course Topic Subject Blocks	Frequency	Cum. Freq.	Percent	Cum. Percent
Block II.a and II.b (Topics recommended by both models and topics recommended by ACM only)	66	66	55.9	55.9
Block II.a and II.c (Topics recommended by both models and topics recommended by DPMA only)	10	76	8.5	64.4
Block II.b and II.c (Topics recommended by the ACM model only and topics recommended by DPMA only)	14	90	11.9	76.3
Block II.a, II.b, and II.c (Topics recommended by both models, topics recommended by the ACM model only and topics recommended by the DPMA model only)	28	108	23.7	100.0
NO RESPONSE	21	139	----	-----

TABLE XV

RESPONDENTS FAMILIARITY WITH THE DPMA AND ACM CURRICULUM MODELS

ACM Model Curriculum	Frequency	Cum. Freq.	Percent	Cum. Percent
YES	14	14	10.9	10.9
NO	114	128	89.1	100.0
NO RESPONSE	11	139	----	-----

DPMA Model Curriculum	Frequency	Cum. Freq.	Percent	Cum. Percent
YES	16	16	12.6	12.6
NO	111	127	87.4	100.0
NO RESPONSE	12	139	----	-----

fourteen, or just under 11 percent of the respondents, are familiar with the ACM Information Systems Model Curriculum while 114, or just over 89 percent, are not. Eleven managers gave no response.

Sixteen, or 12.6 percent of the respondents, are familiar with the DPMA Information Systems Model Curriculum. One-hundred and eleven, or over 87 percent, are not familiar with this model curriculum.

It is interesting to note the extremely low knowledge rates (10.9 and 12.6 percent) for the models in question.

An Analysis of Other Subject Titles Not Mentioned on the Questionnaire

Table XVI presents data dealing with the last question in part II of the questionnaire. Other subject titles recommended by the responsing managers are summarized according to subject title and frequency of this response.

It is interesting to note that structured analysis was mentioned most often. Other topics of interest were data communications, data dictionary, microcomputer use, on-line systems, networks, large database management, recovery techniques, and audit trails.

Analysis of the Respondents Current Database System

The following section presents responses dealing with the current database system in use at the responding managers' business organizations. On question 1, 3, and 4, space was provided on the questionnaire for "other" responses. Manager responses are included in the following discussion.

TABLE XVI

OTHER SUBJECT TITLES RECOMMENDED BY THE RESPONDENTS NOT MENTIONED ON THE QUESTIONNAIRE

Subject Title	Frequency
Structured Analysis, Design, Implementation, Testing, Maintenance	4
Data Communications (teleprocessing)	3
Data Dictionary	3
Microcomputer Use	3
On-line Systems	2
Networks	2
Large Database Management	2
Recovery Techniques	2
Audit Trails (logging)	2
Metadata Management	1
Hardware Maintenance	1
Software Productivity Tools	1
Gateways	1
User Management	1
Project Management	1
Business Overview	1
Indexing Languages	1
Ownership of Data	1
Recovery of Data	1
Integration of Data	1
User Interface	1
Database Limitations	1
New Program and Software Assessment	1
Time Series Databases	1
Text Processing	1
Advanced Storage Techniques (Optical, holographic)	1
Natural Language Processing	1
Proliferation of Databases	1

TABLE XVI (Continued)

Subject Title	Frequency
Duplication of Effort in Databases	1
Database Pricing	1
Data Integrity	1
Managing Personnel (Organizational Behavior)	1
Inter-personal Relationships (Negotiating)	1
Effective Communications (written and oral)	1
Micro/Mainframe Links	1
Database - User Perspective	1

The database system (Part III) included six questions. (See Appendix A for complete questions.) For brevity each question has been abbreviated before being used in a table. Items in Part III are presented and followed by the number of responses and the analysis of the data. Questions 1, 2, 3, and 4 were analyzed using the SPSS-X system. Questions five and six were tabulated by hand.

Respondents were asked to indicate the current commercial DBMS (database management system) being used by their organization. As presented in Table XVII, 17, or 16.2 percent of the responding managers, use IMS (Information Management System database system marketed by IBM). Eighty-eight, or 83.8 percent, do not.

Ten respondents, or 9.5 percent, use IDMA (Integrated Data Management System database system marketed by Cullinane Corporation). Ninety-five, or 90.5 percent, do not use the system.

No organization presently employes the MAGNUM (a relational system maintained by TYMSHARE) database system.

Eleven respondents, or 10.5 percent, use the System 2000 (a hierarchical system marketed by MRI Systems Corporation). Ninety-six organizations, or 89.5 percent, do not use System 2000.

Five organizations, or 4.8 percent, use the TOTAL (a network system marketed by CINCOM Systems) database management system. One hundred, or 95.2 percent, do not use the system.

Five organizations, or 4.8 percent, use the MODEL 204 (a data inversion system marketed by the Computer Corporation of America) database management system. One hundred, or 95.2 percent, do not use it.

Ten organizations, or 9.5 percent, use the ADABAS (Adaptable Database System marketed by Software AG of North America) database system.

TABLE XVII

CURRENT COMMERCIAL DBMS BEING USED
BY THE RESPONDENT"S ORGANIZATION

DBMS Used	Frequency	Cum. Freq.	Percent	Cum. Percent
IMS				
Yes	17	17	16.2	16.2
No	88	105	83.8	100.0
No Response	34	139	----	-----
IDMS				
Yes	10	10	9.5	9.5
No	95	105	90.5	100.0
No Response	34	139	----	-----
MAGNUM				
Yes	0	0	0.0	0.0
No	105	105	100.0	100.0
No Response	34	139	-----	-----
SYSTEM 2000				
Yes	11	11	10.5	10.5
No	96	105	89.5	100.0
No Response	34	34	----	-----
TOTAL				
Yes	5	5	4.8	4.8
No	100	105	95.2	100.0
No Response	34	139	----	-----
MODEL 204				
Yes	5	5	4.8	4.8
No	100	105	95.2	100.0
No Response	34	139	----	-----
ADABAS				
Yes	10	10	9.5	9.5
No	95	105	90.5	100.0
No Response	34	139	----	-----

Ninety-five, or 90.5 percent, do not use the system. Thirty-four respondents did not answer this question.

Other database management systems not mentioned on the questionnaire are presented on Table XVIII. The DBMS and frequency of the response is represented in table form. Many respondents use more than one DBMS.

Section III, question 2 deals with any change that may have occurred in the organization's DBMS in the last three years. Table XIX indicated the number of organizations that have changed DBMS. Thirty-three, or 31.1 percent of the responding organizations, have changed DBMS in the last three years. Seventy-three organizations, or 68.9 percent, have not changed DBMS's in the last three years. Thirty-three managers gave no response.

Table XX represents the DBMS's changed to by the responding organizations. The data is represented by DBMS switched to and the frequency of each response.

Table XXI represents frequencies and resulting percentages resulting from the statistical analysis performed of the data obtained from the question dealing with the type of data organization model used in the respondent's database configuration. Many organizations use more than one type of data organization in their database because they use more than one type of database.

Respondents were requested to indicate what type of data organization they used. The statistical analysis revealed the following data: 47 respondents, or 47.0 percent, indicate they use relational data organization. Fifty-three respondents, or 53.0 percent, do not. Thirty-nine respondents gave no response.

TABLE XVIII

OTHER DBMS NOT MENTIONED
ON THE QUESTIONNAIRE

DBMS	Frequency
In-house System	9
dBase II	7
DMS - II (Burroughs)	6
INQUIRE (IBM)	4
System 1022 (DEC)	4
BASIS (DEC)	4
IMAGE QUERY	3
DATATRIEVE	2
UNIFY	2
GIPSY	2
SAS	2
DIALOG	2
DRS	1
SEED	1
SPIRES	1
ECLIPSE S/140	1
CICS	1
DL/1	1
ENSCRIBE	1
MINISIS	1
IDOL	1
INFOS	1
ISIS	1
QUASAR Power PLUS	1
NENCO	1
EPS	1
NOMAD	1
ADR	1
Database/DC	1

TABLE XVIII (Continued)

DBMS	Frequency
TANDEM ENCOMPASS	1
DPL	1
UNIX - Ingres	1
HISAM	1
QFILE	1
DBMS - 10	1
NOMAD 2	1
DMS (General Electric)	1
FOCUS (TYMSHARE)	1
HOMEBREW	1
S138	1
XENIX	1
RECON	1
Hewlett-Packard 1000 Series RTE FMGR	1
X/L (Control Data)	1

TABLE XIX

ANY CHANGES IN DBMS IN
THE LAST THREE YEARS

Response	Frequency	Cum. Freq.	Percent	Cum. Percent
Yes	33	33	31.1	31.1
No	73	106	68.9	100.0
No Response	33	139	----	-----

TABLE XX

DBMS SWITCHED TO BY THE
RESPONDING ORGANIZATION

OLD DBMS	NEW DBMS	FREQUENCY
WILBUR		2
UNIVAC 9300	UNIVAC SYS/80	1
---	BURROUGHS 6900	1
---	X/L	1
---	PRIME DBMS	1
---	ALTOS 8600	1
---	DEC	1
---	APL	1
IBM	WANG VS	1
PDP 1170	DEC 2060	1
---	IDMS	1
S/34	S/38	1
---	ADABAS	1
---	DATABANK	1
PL/1 and Fortran	SAS	1
---	BASIS	1
PDP 11/03	IBM Series 1	1
HONEYWELL	BURROUGHS DMS II	1
System 2000	IMS	1
---	IMS	1
CSC	ADABAS	1
MAP	QFILE	1
HASP	JES 3	1
---	WANGEZ	1
DG NOVA	DG Eclipse	1
IBM/STAIRS	BRS/SEARCH	1
---	dBASE II	1

TABLE XXI

TYPE OF DATA ORGANIZATION

DATA ORGANIZATION	Frequency	Cum. Freq.	Percent	Cum. Percent
RELATIONAL				
Yes	47	47	47.0	47.0
No	53	100	53.0	100.0
No Response	39	139	----	-----
NETWORK				
Yes	26	26	26.0	26.0
No	74	100	74.0	100.0
No Response	39	139	----	-----
HIERARCHICAL				
Yes	54	54	54.0	54.0
No	46	100	46.0	100.0
No Response	39	139	----	-----
OTHER				
Yes	12	12	12.0	12.0
No	88	100	88.0	100.0
No Response	39	139	----	-----

Twenty-six, or 26.0 percent of the responding managers, state they use network data organization. Seventy-four, or 74.0 percent, do not. Thirty-nine managers had no opinion.

Fifty-four, or 54.0 percent, maintain they use hierarchial data organization. Forty-six, or 46.0 percent of the respondents, do not. Thirty-nine managers gave no opinion.

Twelve managers, or 12.0 percent, indicate they use some other type of data organization. Table XXII represents manager responses other than those mentioned in the questionnaire. The type of data organization used and frequency of each specific type are presented in the table.

Table XXIII uses the frequencies and percentages obtained from the statistical analysis to show the results for Section III, Question 4, a question dealing with the security measures evolved to protect the respondent databases. The following results were obtained: 105 respondents, or 87.5 percent, use password protection. Fifteen, or 12.5 percent, do not. Nineteen managers did not respond.

Sixty-eight, or 56.6 percent of the responding managers, use personal user access codes. Fifty-two, or 43.4 percent, do not use them. Once again, nineteen managers did not respond.

Forty-three, or 35.8 percent, use physical security. Seventy-seven respondents, or 64.2 percent, do not use it. Nineteen respondents did not respond.

Forty-one, or 34.1 percent, use restricted access methods. Seventy-nine, or 65.9 percent, do not use restricted access methods. Nineteen managers did not respond. Thirteen managers, or 10.8 percent, responded with other types of security measures not mentioned in the

TABLE XXII

DBMS DATA ORGANIZATIONAL MODELS NOT MENTIONED ON THE QUESTIONNAIRE

DATA ORGANIZATION	FREQUENCY
Unknown	3
In-house	2
Inverted File	2
Time Series Cross Sectional	1
Files with Generic Tools	1
Jackson/Wines and Sarson	1
Proprietary	1
Chains of Data Pages	1
Relational and Hierarchical	1
Direct Access Files	1
VSAM Structured Files	1

TABLE XXIII

DATABASE SECURITY MEASURES

Security Measure	Frequency	Cum. Freq.	Percent	Cum. Percent
Password				
Yes	105	105	87.5	87.5
No	15	120	12.5	100.0
No Response	19	139	----	-----
Personal User Access				
Yes	68	68	56.6	56.6
No	52	120	43.4	100.0
No Response	19	139	----	-----
Physical Security				
Yes	43	43	35.8	35.8
No	77	120	64.2	100.0
No Response	19	139	----	-----
Restricted Access Method				
Yes	41	41	34.1	34.1
No	79	120	65.9	100.0
No Response	19	139	----	-----
Other				
Yes	13	13	10.8	10.8
No	107	120	89.2	100.0
No Response	19	139	----	-----

questionnaire. Table XXIV presents the data obtained by security measure and the frequency of each response.

Table XXV represents the data collected for the response from Section III, Question 5. The listing of large centrally located computers used by the respondent organization and the frequency of each response is represented.

It is probably no surprise that IBM leads all other mainframe response by a count of 57 to 52. These figures reflect IBM's current and continuing lead in the mainframe market.

Table XXVI represents data collected from Section III, Question 6. The table portrays the other hardware used in the respondents database management system configuration. Minicomputers, microcomputers and other types of hardware are represented.

Comparison of Selected Items in the Study Instrument

Statistics from two-way tables were utilized in comparing various items from the questionnaire. The chi-square test for significance was computed for each of the comparisons. The .05 level of significance was selected for this study.

The educational backgrounds of the respondents were compared with the database topics managers believed most closely approximate the knowledge needed by database professionals.

The relationships which were investigated between specific respondent educational background and recommended database topics are presented in Appendix C. Statistical data for all comparisons are shown utilizing two-way tables with each cell containing information in the following sequence: observed frequency, expected frequency, row percent, column

TABLE XXIV

OTHER SECURITY MEASURES NOT MENTIONED
ON THE QUESTIONNAIRE

Security Measure	Frequency
TRON - Electronic Security	3
Specialized Software	3
Employee Background Checks	1
Encoding	1
Using Security Fields within Records	1
Menu-System with Restricted Access	1

TABLE XXV

LARGE CENTRALLY-LOCATED MAINFRAMES
USED BY RESPONDENT ORGANIZATIONS

Manufacturer and Model	Frequency
IBM 3081	12
IBM 3033	9
IBM 4341	8
AMDAHL V7 and V8	8
IBM 370/158	7
DEC-10	6
DEC-20	5
IBM 4331	5
IBM 3330	5
VAX 11/700 Series	5
Univac 1100	5
Burroughs 6900	4
IBM 3083	4
CDC 6500	4
PRIME 750	3
IBM 360	2
Wang VS-100	2
Honeywell L60	2
Tandem TNS II	1
Burroughs B-2930	1
NAS 7000	1
HARMS - 210	1

TABLE XXVI

OTHER HARDWARE USED IN THE RESPONDENT DATABASE MANAGEMENT SYSTEMS (MINI, MICRO-COMPUTERS)

Manufacturer and Model	Frequency
IBM PC	18
APPLE IIe	10
ATEX PDP 11/34	4
TRS 80 Model II	4
HP 3000 II	3
OSBORNE EXECUTIVE	2
Hewlett-Packard 1000	2
TANDEM NONSTOP II	2
Commodore Pet	1
TI Silent 700	1
Digital VT 100	1
Data General Nova 4	1
TI 763	1
PIEXUS P/35	1
HP 9816 S	1
Data General S-250	1
Quasar Power Plus	1
Apple III	1

percent, percent of total. Row and column totals and percentages are presented as well as the results of chi-square tests and significance levels.

Comparison of Respondent Education Background by Subject Block which most Closely Approximates Database Knowledge Needed by Database Employees

For purpose of comparison, educational background was grouped into seven parts: (1) Computer Science, (2) Information Systems, (C.S.), (3) Computer Information Systems (BUS), (4) Management Science/Organizational Research, (5) Mathematics, (6) Engineering, (7) other.

Two-thirds, or 66.7 percent, of the responding managers classified as Computer Scientists believe topic blocks IIA and IIB (topics recommended by both curriculums and topics recommended by the ACM only) most closely approximates the knowledge database employees should have. The remaining third, or 33.3 percent, indicated that all topics on the questionnaire were important to database employees.

Because most computer scientists are technically minded people, the findings are not unexpected and the response of IIA and IIB reflects this technical bent.

One-third, or 33.3 percent of the responding managers with Information System (C.S.) educational backgrounds, contend topic blocks IIA and IIB (topics recommended by both curriculums and ACM only) approximates the database knowledge needed. The other two-thirds, or 66.7 percent of the responding managers, believe topic blocks IIA and IIC (topics recommended by both curriculums and DPMA only) most closely

approximates the database knowledge needed for success when working with commercial databases.

One-half, or 50.0 percent of the managers who answered with Business Computer Information System educational background, state topic blocks IIA and IIB (both and ACM only) most closely approximates the database knowledge needed. One-fifth, or 20.0 percent, believe topic blocks IIB and IIC (ACM only and DPMA only) most closely approximates the needed knowledge. The remaining thirty percent believe that all three subject blocks should be recommended.

Sixty percent of the responding managers who come from management science backgrounds, contend topic blocks IIA and IIB (both curriculums and ACM only) should be recommended. The other 40 percent believe all three topic areas are important.

Over one-half, or 56.3 percent of the responding managers with mathematics backgrounds, contend that topic blocks IIA and IIB (topics recommended by both ACM and DPMA and ACM only) most closely approximates the needed knowledge. Approximately one-tenth, or 12.5 percent, believe topic blocks IIB and IIC (ACM only and DPMA only) should be recommended. The other 31.3 percent recommend all three topic areas.

Seventy percent of the responding managers with engineering backgrounds, state that topic blocks IIA and IIB (topics recommended by ACM and DPMA and ACM only) is the best approximation of the needed database information. Ten percent recommend topic blocks IIA and IIC (both curriculums and DPMA only) and the other 20 percent recommend topic blocks IIB and IIC (ACM only and DPMA only).

Over half, or 51.8 percent of the respondents with educational backgrounds other than those mentioned in the questionnaire, recommend

topic blocks IIA and IIB (topics recommended by both ACM and DPMA and topics recommended by ACM only). Over one-tenth, or 12.5 percent, recommend topic blocks IIA and IIC (both and DPMA only); 14.3 percent recommend topic blocks IIB and IIC (ACM only and DPMA only); and over one-fifth, or 21.4 percent, recommend all three topic areas.

Over half, or 51.8 percent of all responding managers, believe topic blocks IIA and IIB should be recommended. This trend tends to give added support to the ACM model curriculum. Although these results are interesting, the expected frequencies in over 20 percent of the cells are less than five. This makes it virtually impossible to contend there is any significant meaning in the results. The chi-square test for significance reveals that there is no significant difference at the .05 level between education background and database topics recommended.

Comparison of Respondents Experience as a Database Manager/Administrator or DP Manager by Subject Block which most Closely Approximates Database Knowledge needed by Database Employees

For purpose of comparison, Database Manager/DP Manager work experience was grouped into these five categories: (1) less than one year, (2) one to two years, (3) three to four years, (4) five to six years, (5) and more than six years.

Almost half, or 47.1 percent, of the responding managers with less than one year experience contend topic blocks IIA and IIB (topics

recommended by both curriculums and topics recommended by the ACM model curriculum only) most closely approximates needed database knowledge. Over one-tenth, or 11.8 percent, of the responding managers believe topic blocks IIA and IIC (both models and DPMA only) most closely approximates the knowledge needs of database professionals. The other 41.2 percent believe all three topic blocks are of equal importance.

Close to two-fifths, or 39.2 percent, of the responding managers with one to two years of database manager/DP manager experience recommend topic blocks IIA and IIB (both curriculums and ACM only). Over one-tenth, or 10.7 percent recommend topic blocks IIA and IIC (both curriculums and ACM only). Over one-tenth, or 10.7 percent recommend topic blocks IIA and IIC (both curriculums and DPMA only). One-fourth of the responding managers, or 25.0 percent, recommend topic blocks IIB and IIC (ACM only and DPMA only). The final one-fourth, or 25.0 percent, recommend all three topic blocks.

Two-thirds of the responding managers with three to four years experience, or 66.7 percent, recommend topic blocks IIA and IIB (both curriculums and DPMA only). Less than one-tenth, or 6.5 percent, recommend topic blocks IIA and IIC (both curriculums and DPMA only). Almost one-tenth, or 9.7 percent, recommend topic blocks IIB and IIC (ACM only and DPMA only). The final 16.1 percent recommend all three topic blocks.

Sixty percent of the responding managers with five to six years experience recommend topic blocks IIA and IIB (both curriculums and ACM only). One-tenth, or 10.0 percent, recommend topic blocks IIA and IIC (both curriculums and DPMA only). One-tenth of the responding managers, or 10.0 percent recommend topic blocks IIB and IIC (ACM only and DPMA

only). The final one-fifth, or 20.0 percent, recommend all three topic blocks.

Over half, or 62.5 percent, of the responding managers with over six years of database management/DP management experience recommend topic blocks IIA and IIB (both curriculums and ACM only). Less than one-tenth, or 6.3 percent, recommend topic blocks IIA and IIC (both models and DPMA only). Close to one-tenth, or 9.4 percent, recommend topic blocks IIB and IIC (ACM only and DPMA only). The final one-fifth, or 21.9 percent, of the responding managers recommend all three topic blocks.

Over half, or 55.9 percent of the total responding managers recommended topic block IIA and IIB (topics recommended by both the ACM and DPMA model and topics recommended by the ACM model curriculum only). Once again, this result tends to support the recommendation of ACM, although the results are interesting. The expected frequencies in over 20 percent of the cells are less than five. This would negate any significance finding if it were present. The chi-square test for significance reveals no significant difference at the .05 level between years experience as a database manager/DP manager and database topics recommended.

The relationships which were investigated between database manager/DP manager work experience and recommended database topics are presented in Appendix C.

Summary

This chapter presents a detailed analysis of the results gathered from the questionnaire. The analysis of the data obtained was divided

into eight sections: an analysis of the database managers educational and work experience; an analysis of database manager opinions dealing with database management topics suggested by the DPMA and ACM model curriculum; an analysis of database manager opinions dealing with database management topics suggested only by the ACM model curriculum; an analysis of database manager opinions dealing with database management topics suggested only by the DPMA model curriculum; an analysis of course topics (subject blocks - IIA, IIB, IIC) that most closely approximates the knowledge needed by database management professionals; an analysis of other subject titles not mentioned on the questionnaire; an analysis of the Respondents Current database system; and comparison of selected items in the study instrument.

The results from each item were tabulated and presented according to the frequency of occurrence, accumulative frequency, percentage, and accumulative percentage. Two-way tables and the chi-square test for significance were utilized in comparing and revealing relationships between selected items found in the questionnaire. Specific results were summarized and reported through detailed discussions and tables within this chapter and Appendix C.

The summary, conclusions, and recommendations are presented in Chapter V.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Computer Science and Data Processing are disciplines that change as rapidly as the technology used to create and maintain it changes. As technology advances and database utilization becomes an important part of our lives, educators in the information systems area should continually update to meet the demands of business.

The phenomenal proliferation of databases has created an educational gap now being felt in higher education. In the decade of the 1970's, two educational organizations undertook the long overdue task of creating a Computer/Information Systems model curriculum to fill this gap. Both organizations proposed a model curriculum for Information Systems education. An important part of the models was a database management/concepts class to be taught at the upper division level.

Purpose and Design of the Study

The purpose of this study was to provide information (1) to determine what subject matter database managers feel should be taught to potential employees and to determine (2) which model curriculum most closely resembles these recommendations. This was accomplished by using an interpretative analysis of the data obtained from questionnaires mailed to business organizations listed in the current Directory of Online Databases. By comparing some of the data from the study, it

was possible to reveal the opinions of database managers on database management topics recommended by the ACM and DPMA models.

The Study Instrument

In accomplishing the purpose of this study concerning database management course topics and database manager opinions of these topics, a four page, yellow-printed questionnaire (8½ by 11 inches) was designed. The questionnaire was formulated from a thorough study of related literature, other research questionnaires concerned with information systems, a pilot study was sent to database managers in the Oklahoma region, and interviews and consultations with Oklahoma State University and Emporia State University faculty members. In the fall of 1983, this questionnaire was mailed to 465 business organizations which use of have commercial databases. One hundred and thirty-nine database managers sent back a response.

Analysis of the Data

All the responses to the questionnaire were coded and analyzed with the help of the SPSS-X statistical software package. Frequency counts and percentage relationships made it possible to analyze the collected data while two-way tables and chi-square tests were used to describe the comparison of selected questions in the study instrument.

Reveiw of Related Literature

A review of literature reporting research was undertaken in the areas affecting the database industry, and an extensive review was made of the texts of both model curriculums.

As presented in the review of literature chapter, computer technology has had a vast impact on society and the trend toward more and better databases is expected to continue.

Many articles have been written about the two curriculums, but no one has undertaken the task of combining them. The purpose of any curriculum is to set up guidelines that promise to benefit the educational area in question. Most database professionals believe the current state of affairs will have to change before higher educational institutions will be able to train adequately database professionals and database users.

This study further extends knowledge of information systems education by reporting in detail the opinions of database managers concerning topics which should in their opinions be taught in a database curriculum.

Results of the Study

The results of the study are summarized in the following eight sections: (1) respondent's educational and work experience, (2) database manager opinions of topics recommended by both curriculums, (3) database manager opinions of topics recommended by the ACM model only, (4) database manager opinions of topics recommended by the DPMA model only, (5) an analysis of course topics that most closely approximates the knowledge needed by database professionals, (6) other subject titles which should be included in the curriculum models, (7) respondent's current database systems, and (8) comparison of selected items in the study instrument.

Respondents Educational and Work Experience

Approximately three-fourths of the 139 responding managers have been in database manager/administrator or DP manager positions for six years or less. Over 40 percent have held this position for less than three years. Slightly over one-fourth of the respondents have had more than six years experience.

The educational backgrounds of the managers are from a wide variety of disciplines. Over 10 percent come from computer science backgrounds. Approximately another 10 percent have mathematics backgrounds, while just under 10 percent come from engineering schools. It is especially interesting to note that almost 10 percent of the respondents come from a discipline not mentioned on the questionnaire; namely, Library Science. Nine respondents come from a chemistry educational background.

Approximately half of the respondents hold a master's degree or above. Almost 85 percent hold a bachelor's degree or above, while over 95 percent have some college work.

Approximately half of the respondents directly supervise fewer than six employees in their database operation. Over three-quarters of the respondents directly supervise 15 employees or fewer.

Approximately 17 percent of the respondents belong to one of the data processing organizations mentioned in the questionnaire. It is interesting to note that over 10 percent belong to an organization not mentioned on the study instrument: American Society for Information Science (ASIS). Over 60 percent of the respondents are members of an organization other than the ones mentioned on the questionnaire.

The respondents work backgrounds are also wide and varied. Over half of the respondents have some programming experience. Nearly 40

percent have been systems analysts. More than 60 percent have database management experience, while the same percentage have formal management experience.

Database Manager Opinions of Topics Recommended by Both Models

The respondents consistently gave an important ranking of 40 percent or above for all ten topics recommended by both curriculum models. The low was 37.8 percent for network data model, the high was 74 percent for the course overview.

Topics Recommended by the AMC Model Only

In 8 of the 12 topics, the managers ranked the course topics, recommended by the ACM model only, consistently important to very important in over 50 percent of the responses.

Topics Recommended by the DPMA Model Only

Over one-half of the respondents thought the topics recommended by the DPMA model only were important.

Topics That Most Closely Approximates Needed Dabatase Knowledge

While rankings for all topics were for the most part more than 50 percent positive, the results of the question dealing with which topics most closely approximates the database knowledge needed clearly showed a preference. Well over one-half of the respondents indicated the topics recommended by both curriculum models and the topics

recommended by the ACM only were their choice. However, one-quarter of the respondents felt all topics were needed for a well-trained database employee.

There appears to be no significant bias stemming from prior knowledge of any model curriculum. The low response rate from managers on their familiarity with the DPMA and ACM models tends to support this.

Respondents Current Database System

The commercial DBMS with the highest response rate was IBM's Information Management System (IMS), with over 16 percent. ADABAS, System 2000, and IDMS were the next highest responses with each one preferred by approximately 10 percent of the respondents. Added together this represents another 30 percent. Of the DBMS's not mentioned on the questionnaire, three are worthy of note. In-hours system, dBase II, and DMS-II (Burroughs) combined to represent approximately 16 percent of the total responses.

Over 30 percent of the respondent organizations had changed databases in the last three years. This is indicative of the extremely swift obsolescence in the computer industry.

The most popular data organization was hierarchical, with over one-half of the respondents using this type. However, relational data organization was a close second at just under one-half. The totals add up to more than 100 percent due to the fact of multiple database use by many of the respondent organizations.

There were some interesting results with respect to database security measures. Over 85 percent of the respondents use password protection. Over one-half of the respondents use personal-user access

methods. Almost 40 percent of the respondents use physical security and restricted access methods. It appears that all databases have some type of security system.

Approximately half of all the responding managers use some type of IBM hardware with the database management system employed. Since IBM is the leader in the hardware field, this fact is not a surprise.

Comparison of Selected Items in the Study Instrument

Comparison of educational backgrounds and data topics recommended by the respondents revealed that over one-half of all respondents believe the ten topics recommended by both models and the twelve topics recommended by the ACM model only should be used as a guide for database management/concepts courses in higher education. Managers, regardless of educational background, ranked these topics in importance from 50 to 70 percent. The only other item with over a twenty-five percent response rate was the one for all of the topics.

Comparison of respondent work experience as a database manager and subject blocks recommended revealed that over half of the managers, no matter what their experience, chose the 10 topics recommended by other curriculum models and the twelve topics recommended by the ACM model. The only group not agreeing with this preference was database managers with from one to two years experience. This group gave these subject blocks a 30 percent ranking while they gave a 25 percent ranking to topics recommended by the ACM only and topics recommended by the DPMA only. However, an additional 25 percent of this group did recommend all three topic areas.

Results from comparisons of respondent's educational backgrounds and database management work experience with data topics disclosed that educational and work backgrounds are not significant factors in determining the model curriculum database managers support. While there are no significant results, the numbers tend to support the more technically oriented ACM model slightly.

Conclusions and Recommendations

The following conclusions and recommendations are based on the results of the descriptive analysis of database manager opinions and on the review of related literature.

1. Review of related literature indicates some experts and database managers believe the database management/concepts course can best be taught by people who have practical database work experience.

2. Review of related literature indicates some experts and database managers believe the best place to teach database management/concepts is not in the college classroom, but at the actual database site itself.

3. Although a certain percentage of the respondents recommend all the topics in both curriculums, a majority of those responding believe the ten core topics recommended by both curriculums and the twelve topics recommended by the ACM model give the future database employee the best knowledge base for a database career.

4. A majority of respondents have held the database management position for less than seven years. This is indicative of the virtual explosion in the number of databases over the past decade.

5. While educational backgrounds vary, a large percentage of

database managers come from technical backgrounds. The vast majority of database managers hold college degrees.

6. A number of database using organizations exist. But in terms of employee size, most database shops are small.

7. The majority of database managers have some type of computer related work experience (programmer, systems analyst).

8. The majority of database managers have prior management experience.

9. IBM is the leader in hardware system support for current in-place database management systems.

10. An overwhelming percentage of in-place databases use some form of security. Password protection and user-access codes tend to be the most popular.

11. There is a demand for qualified teachers in the database area. But reveiw of related literature indicates business leaders believe the current population of professors do not have this needed experience.

Recommendations for Future Research

1. Studies similar to this one should be made to obtain information about the curriculum models preferred by educators.

2. Studies similar to this one should be made in which database managers are surveyed to obtain infromation on the changing technology and the effects those changes have on database curriculums.

3. More studies using database organizations are needed to determine the database knowledge needed by graduates in the information systems area.

4. In-depth studies are needed in all the courses recommended in

the computer science and information systems area to determine what is being taught and what should be taught.

5. Studies about all aspects of the database environment, and additional uses for the database, should be undertaken in order to explore this technology's inherent potential.

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APPENDIX A

THE STUDY INSTRUMENT

_____
Identification Number

QUESTIONNAIRE ON DATABASE MANAGEMENT TOPICS
RETURN TO: COLLEGE OF BUSINESS ADMINISTRATION, EMPORIA STATE UNIVERSITY
EMPORIA, KANSAS 66801

This questionnaire is a survey of Database Managers to determine what subject matter needs to be taught to future database professionals. Please complete the questionnaire by checking the appropriate response.

I. DATABASE MANAGER/ADMINISTRATOR OR DP MANAGER (PERSONAL INFORMATION)

1. Please indicate how long you have held this position.
   (1) _____ less than 1 year
   (2) _____ 1 - 2 years
   (3) _____ 3 - 4 years
   (4) _____ 5 - 6 years
   (5) _____ more than 6 years

2. What is your educational background? (Check the one topic that closely describes your educational background.)
   (1) _____ Computer Science
   (2) _____ Information Systems
   (3) _____ Computer Information Systems
   (4) _____ Management Science/Organizational Research
   (5) _____ Mathematics
   (6) _____ Other (Please Specify) _____

3. What is the highest educational level you have obtained?
   (1) _____ PhD or _____ EdD
   (2) _____ MBA or _____ MS or _____ MA
   (3) _____ BS or _____ BA
   (4) _____ Associate Degree
   (5) _____ Some College Work
   (6) _____ High School
   (7) _____ Other (Plese Specify) _____

4. How many employees do you directly supervise?
   (1) _____ none
   (2) _____ 1 - 5
   (3) _____ 6 - 10
   (4) _____ 11 - 15
   (5) _____ 16 - 20
   (6) _____ more than 20

5. Please identify the Data Processing professional organization of which you are a member. (Check all that apply)
   (1) _____ DPMA
   (2) _____ ACM
   (3) _____ SDE
   (4) _____ Other (Please Specify) _____
   _____
   (5) _____ None

6. Please identify all the areas in which you have work experience in the data processing area. (Check all that apply.)
   (1) _____ Application Programmer or Programmer/Analyst
   Years experience? _____
   (2) _____ Information Systems Specialist
   Years experience? _____
   (3) _____ Systems Analyst/Systems Engineer
   Years experience? _____
   (4) _____ Database Administrator/Manager
   Years experience? _____
   (5) _____ Finance
   Years experience? _____
   (6) _____ Marketing
   Years experience? _____
   (7) _____ Management
   Years experience? _____
   (8) _____ Accounting
   Years experience? _____
   (9) _____ Other (Please Specify) _____
   _____

II. DATABASE COURSE SUBJECT AREAS

Please indicate the importance of each of the following database course subject areas to Database Managers concerning database management employees.

A. TOPIC	VERY IMPOR.	IMPOR.	AVERAGE IMPORTANCE	UNIMPORTANT	VERY UNIMPORTANT
1. Overview (database development, issues)					
2. Applied Data Structures					
3. Hierarchial Data Model					
4. Network Data Model					
5. Relational Data Model					
6. Database Administration					
7. Data Environment, Manage and Defining Data					
8. Role of Database Information Systems					
9. Relational Systems, Relational Databases					
10. Use & Management of Databases					

B.

TOPIC	VERY IMPOR.	IMPOR.	AVERAGE IMPORTANCE	UNIMPORTANT	VERY UNIMPORTANT
1. Basic Tech. Concepts for Data					
2. Systems Resources for Data					
3. Basic Machine Architecture					
4. Searching & Sorting Tech.					
5. Operating System Topics					
6. Dynamic Storage Management					
7. Database Management Sys.					
8. Integrated Databases					
9. Memory Management					
10. Use of High Level, User Oriented Data Languages					
11. DBMS Evaluation					
12. Distributed Databases					

C.

TOPIC	VERY IMPOR.	IMPOR.	AVERAGE IMPORTANCE	UNIMPORTANT	VERY UNIMPORTANT
1. Storage Device Characteristics & Physical Input/Output					
2. Indexed Organized Files					
3. Direct File Organization					
4. Data Model Overview DDL, DML					
5. Character Codes					

1. Which two or three subject blocks most closely approximates the knowledge you want your employees to have?

   (1) ___ A & B (2) ___ A & C (3) ___ B & C (4) ___ A&B&C

2. Are you familiar with the following recommended model curriculas?

   (1) ACM _____ YES _____ NO (2) DPMA _____ YES _____ NO

3. Please indicate any subject titles you would recommend in the database area that have not been previously mentioned.

_____

_____

III. DATABASE SYSTEM (DEALING SPECIFICALLY WITH YOUR LARGE MAINFRAME COMPUTERS.)

1. What commercial Database Management System are you currently using in your company? (Check all that apply)
   (1) _____ IMS
   (2) _____ IDMS
   (3) _____ MAGNUM
   (4) _____ SYSTEM 2000
   (5) _____ TOTAL
   (6) _____ MODEL 204
   (7) _____ ADABAS
   (8) _____ Other (Please Specify) _____

2. Have you switched to any new system or systems in the last 3 years?
   (1) _____ YES. If so, from which system(s) to which? _____

   _____

   (2) _____ NO.

3. What type of data organization model does your Database Management System of systems use? (Check all that apply.)
   (1) _____ Relational
   (2) _____ Network
   (3) _____ Hierarchial
   (4) _____ Other (Please Specify) _____

4. What security measures are used to protect the integrity of your database?
   (1) _____ Password
   (2) _____ Personal User Access Codes
   (3) _____ Physical Security
   (4) _____ Restricted Access Methods
   (5) _____ Other (Please Specify) _____

   _____

5. What large centrally-located computer mainframe do you use? (Please specify manufacturer and model or models.)

   _____

   _____

6. If you use other hardware in your DBMS (mini-micro-computers), please specify manufacturer(s), and commercial database management system(s) used.

   _____

   _____

APPENDIX B

CORRESPONDENCE TO DATABASE MANAGERS IN SELECTED BUSINESS ORGANIZATIONS

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

August 9, 1983

Dear Database Administrator/Supervisor or Data Processing Manager:

SUBJECT: DATABASE MANAGEMENT TOPICS SURVEY

The use of electronic data processing has dramatically changed the roles of Data Processing professionals in business and industry. I am requesting your assistance in determining the database education which will allow database managers and database employees the greatest possible assistance in doing their job: working with and managing information. It is the purpose of this study to collect data which will help identify what knowledge is needed.

Your company was selected from the current "Directory of Online Databases". As the Database/Data Processing Manager of your company, would you please complete the enclosed questionnaire. Your questionnaire will be identified only by the researcher who will use the ID number for follow-up purposes. Neither you nor your firm will be identified in the study. If possible the questionnaire should be returned on or before August 31. An addressed, stamped envelope is enclosed for your convenience in returning the questionnaire.

Your cooperation is appreciated. By taking a few minutes of your valuable time (or the time of a person in your firm whom you identify) to provide professional expertise, you are contributing to the development of more effective education for the database and data processing professional. Thank you for participating in this study.

Sincerely,

Jack Dean Shorter

H. M. Jelley
Dissertation Advisor

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

September 1, 1983

Dear Database Administrator/Supervisor or Data Processing Manager:

SUBJECT: FOLLOW-UP OF DATABASE MANAGEMENT TOPICS SURVEY

Recently you received a questionnaire requesting your participation in a study to determine the database professional's need for database education. This is a national survey involving companies listed in the "Directory of Online Databases". At the time this letter was mailed, a response had not been received from your firm. If the questionnaire has since been completed and returned, I thank you.

As the database/data processing supervisor of your company, would you please complete the enclosed questionnaire. If possible, the questionnaire should be returned on or before September 21. An addressed, stamped envelope is enclosed for your convenience in returning the questionnaire.

Your cooperation is appreciated. By providing your professional expertise, you are contributing a great deal toward the development of more effective education for the database and data processing professional.

Sincerely,

Jack Dean Shorter

H. M. Jelley
Dissertation Advisor

APPENDIX C

RESULTS OF SELECTED ITEM COMPARISON TESTS IN THE STUDY INSTRUMENT

TABLE XXVII

COMPARISON OF RESPONDENT EDUCATIONAL BACKGROUND BY SUBJECT BLOCK WHICH MOST CLOSELY APPROXIMATES DATABASE KNOWLEDGE NEEDED BY DATABASE EMPLOYEES

Educational Background	Topic Blocks II.a and II.b (Topics rec. by both and ACM only)	Topic Blocks II.a and II.c (Topics rec. by both and DPMA only)	Topic Blocks II.b and II.c (Topics rec. by ACM only and DPMA only)	Topic Blocks II.a, II.b and II.c (Topics recommended by both and ACM only and DPMA only)	
Computer Science					Total
Observed Frequency	12	0	0	6	18
Expected Frequency	10.07	1.52	2.14	4.27	
Row Percent	66.70	0.00	0.00	33.30	
Column Percent	18.20	0.00	0.00	21.40	
Percent of Total	10.16	0.00	0.00	5.08	15.24
Information Systems (CS)					
Observed Frequency	1	2	0	0	3
Expected Frequency	1.68	0.25	0.36	0.71	
Row Percent	33.30	66.70	0.00	0.00	
Column Percent	1.50	20.00	0.00	0.00	
Percent of Total	1.00	1.66	0.00	0.00	2.66
Computer Info. Sys. (BUS)					
Observed Frequency	5	0	2	3	10
Expected Frequency	5.59	0.85	1.19	2.37	
Row Percent	50.00	0.00	20.00	30.00	
Column Percent	7.60	0.00	14.30	10.70	
Percent Total	4.24	0.00	1.66	2.54	8.44

TABLE XXVII (Continued)

Educational Background	Topic Blocks II.a and II.b (Topics rec. by both and ACM only)	Topic Blocks II.a and II.c (Topics rec. by both and DPMA only)	Topic Blocks II.b and II.c (Topics rec. by ACM only and DPMA only)	Topic Blocks II.a, II.b and II.c (Topics recommended by both and ACM only and DPMA only)	
Management Science/ Organizational Research					Total
Observed Frequency	3	0	0	2	5
Expected Frequency	2.80	0.42	0.59	1.19	
Row Percent	60.00	0.00	0.00	40.00	
Column Percent	4.50	0.00	0.00	7.10	
Percent of Total	2.54	0.00	0.00	1.66	4.20
Mathematics					
Observed Frequency	9	0	2	5	16
Expected Frequency	8.95	1.36	1.90	3.80	
Row Percent	56.30	0.00	12.50	31.30	
Column Percent	13.60	0.00	14.30	17.90	
Percent of Total	7.63	0.00	1.66	4.24	13.53
Engineer					
Observed Frequency	7	1	2	0	10
Expected Frequency	5.59	0.85	1.19	2.37	
Row Percent	70.00	10.00	20.00	0.00	
Column Percent	10.60	10.00	14.30	0.00	
Percent of Total	5.93	1.00	1.66	0.00	8.59

TABLE XXVII (Continued)

Educational Background	Topic Blocks II.a and II.b (Topics rec. by both and ACM only)	Topic Blocks II.a and II.c (Topics rec. by both and DPMA only)	Topic Blocks II.b and II.c (Topics rec. by ACM only and DPMA only)	Topic Blocks II.a, II.b and II.c (Topics recommended by both and ACM only and DPMA only)	
Other					Total
Observed Frequency	29	7	8	12	56
Expected Frequency	31.32	4.75	6.64	13.29	
Row Percent	51.80	12.50	14.30	21.40	
Column Percent	43.90	70.00	57.10	42.90	
Percent of Total	24.58	5.93	6.67	10.16	47.34
Total	66	10	14	28	
	55.90	8.50	11.90	23.70	100.00
Chi-square and significance level	27.98410 p >	.05 p > .01	significance - 0.0623		

TABLE XXVIII

COMPARISON OF RESPONDENT EXPERIENCE AS A DATABASE MANAGER/ ADMINISTRATOR OR DP MANAGER BY SUBJECT BLOCK WHICH MOST CLOSELY APPROXIMATES DATABASE KNOWLEDGE NEEDED BY DATABASE EMPLOYEES

Database Management Experience	Topic Blocks II.a and II.b (Topics rec. by both and ACM only)	Topic Blocks II.a and II.c (Topics rec. by both and DPMA only)	Topic Blocks II.b and II.c (Topics rec. by ACM only and DPMA only)	Topic Blocks II.a, II.b and II.c (Topics recommended by both and ACM only and DPMA only)	
Less than 1 year					Total
Observed Frequency	8	2	0	7	17
Expected Frequency	9.50	1.44	2.02	4.03	
Row Percent	47.10	11.80	0.00	41.20	
Column Percent	12.10	20.00	0.00	25.00	
Percent of Total	6.67	1.66	0.00	5.93	14.26
1-2 years					
Observed Frequency	11	3	7	7	28
Expected Frequency	15.66	2.37	3.32	6.64	
Row Percent	39.30	10.70	25.00	25.00	
Column Percent	16.70	30.00	50.00	25.00	
Percent of Total	9.32	2.54	5.93	5.93	23.72

TABLE XXVIII (Continued)

Database Management Experience	Topic Blocks II.a and II.b (Topics rec. by both and ACM only)	Topic Blocks II.a and II.c (Topics rec. by both and DPMA only)	Topic Blocks II.b and II.c (Topics rec. by ACM only and DPMA only)	Topic Blocks II.a, II.b and II.c (Topics recommended by both and ACM only and DPMA only)	
3-4 years					Total
Observed Frequency	21	2	3	5	31
Expected Frequency	17.33	2.63	3.68	7.36	
Row Percent	67.70	6.50	9.70	16.10	
Column Percent	31.80	20.00	21.40	17.90	
Percent of Total	17.80	1.66	2.54	4.24	26.24
5-6 years					
Observed Frequency	6	1	1	2	10
Expected Frequency	5.59	0.85	1.19	2.37	
Row Percent	60.00	10.00	10.00	20.00	
Column Percent	9.10	10.00	7.10	7.10	
Percent of Total	5.08	1.00	1.00	1.66	8.74
More than 6 years					
Observed Frequency	20	2	3	7	32
Expected Frequency	17.89	2.71	3.80	7.59	
Row Percent	62.50	6.30	9.40	21.90	
Column Percent	30.30	20.00	21.40	25.00	
Percent of Total	16.91	1.66	2.54	5.93	27.04
Total	66	10	14	28	
	55.90	8.50	11.90	23.70	100.0
Chi-square and significance level	12.89272	p > .05	p > .01	significance - 0.3769	

VITA

Jack Dean Shorter

Candidate for the Degree of

Doctor of Education

Thesis: A COMPARISON OF DATABASE MANAGER RECOMMENDATIONS WITH THE RECOMMENDED UNDERGRADUATE DATABASE SUBJECT MATTER OF THE DPMA AND ACM INFORMATION SYSTEMS MODEL CURRICULA

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