THE UTILIZATION OF MICROCOMPUTERS, MINICOMPUTERS, AND SMALL COMPUTERS IN SMALL BUSINESSES

By

SUSAN DAWN HAUGEN

Bachelor of Science
University of Wisconsin - Eau Claire
Eau Claire, Wisconsin
1972

Master of Science
University of Wisconsin - Stout
Menomonie, Wisconsin
1980

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of the Oklahoma State University
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Thesis Approved:

G. Daryl Nord
Thesis Adviser

Lloyd L Garrison

Lloyd Wiggins

Jeanine M. Rhea

Norman N Durham
Dean of the Graduate College

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THE RESEARCH PROBLEM

Introduction

As Davis (1981, p. vi) states, "Nowhere has the impact of the computer been greater than in the field of business." Most businesses could not operate without a computer. The large amount of paperwork required in all facets of businesss is overwhelming, and the computer enables businesses to keep abreast of the steady flow of information coming in and going out of their doors.

The computer is changing the way information is processed in business. It is changing the way payrolls are processed, accounting records are maintained, correspondence produced, mailed, and filed, and products are manufactured and distributed--to name just a few of the areas in which the information of business is being revolutionized by computers.

When the computer was first developed in the 1940's, only large, major business firms could afford to have a computer. This has changed during the 1970's with the introduction and development of the large scale integrated chips which made possible the manufacture of minicomputers and microcomputers (see definitions, page 6). Minicomputers were first developed in the early 1970's and microcomputers were developed in the latter half of the 1970's. The result has been affordable computer power within the reach of every business. With the development of microcomputers, small businesses can now afford to buy a computer which

has more computing power than the first commerical computer, UNIVAC I, delivered in 1952. Silver and Silver (1981, p. 438) state that "small computer systems represent what is probably the fastest growing area of data processing. U.S. shipments of small computers totaled more than $2 billion in 1978; by 1982 this figure is expected to exceed $5 billion."

Along with the increased purchasing of small computers, there is a corresponding demand for data processing personnel.

> According to the U.S. Bureau of Labor Statistics, in 1974 there were approximately 853,000 people employed in U.S. data processing occupations, 742,000 of them in user organizations. It is forecast that there will be approximately 1.1 million people so employed in the U.S. by 1985 (Canning, 1980, p. 4).

According to Canning (1980), some of the reasons for this growth in data processing personnel are:

1. More machines in business to be programmed, maintained, operated, and managed by data processing departments.
2. User-population is growing because minicomputers and microcomputers have put computing power in the hands of more users, such as small businesses.
3. More software is required because there are more machines.
4. Computers are being used for many new and different types of applications (p. 4).

This study was designed to determine if small businesses are actually purchasing and using small computers (see definition, page 6), and if so, what types and sizes, for what applications, and with what types of data processing employees to maintain the data processing function.

Statement of the Problem

The purpose of this study was to obtain quantitative information concerning the present and future utilization of microcomputers, minicomputers, and small computers in small businesses. This information

will be gathered by a questionnaire mailed to 496 small businesses selected from Dun and Bradstreet's Million Dollar Directory (1982).

The study was designed to identify the following information:

1. The extent of utilization of microcomputers, minicomputers, and small computers in small businesses at the present time.
2. The extent of utilization of microcomputers, minicomputers, and small computers in small businesses in the future.
3. The types of data processing capabilites, other than in-house capabilities, which are utilized by small businesses.
4. The types of business applications in small businesses which were handled by microcomputers, minicomputers, and small computers when the system was initially installed.
5. The types of business applications in small businesses which are handled by microcomputers, minicomputers, and small computers currently.
6. The types of business applications in small businesses which will be handled by microcomputers, minicomputers, and small computers in the future.
7. Identify the number and type of data processing employees at the present time, and the number and type of data processing employees which may be needed by small businesses in the future.

This survey of microcomputer, minicomputer, and small computer usage in small businesses will attempt to determine the amount and effect of small computer technology in the small business of today. The small computer technology being implemented by small business has implications for business education programs. Students need to be trained in business programs today which will provide them with the technological skills necessary to compete in the business world of tomorrow.

Need for the Study

Since the invention of the first electronic computers in the 1940's, the capabilities of computers have continued to increase dramatically while the cost of computers have continued to decrease dramatically. The result has been affordable electronic data processing capability for all sizes of businesses, not just the large businesses like General Motors and Exxon.

> The smallest businesses can buy a fully operational computer (including maximum memory potential, two disk drives for long-term storage media, a CRT or viewing screen, a high-speed printer, and program software) to handle accounts receivables, accounts payables, and general ledger in the $6,000 to $8,000 range. That cost is approximately equal to the cost of adding a clerical employee for maybe six months. The difference in production between the additional employee and the computer is that the computer is more dependable, has better efficiency, and is more accurate. That comparison does not take into account a lot of of varying factors, but it does illustrate why so many small businesses are buying microcomputers. With the cost of performing tasks manually becoming so high, businesspeople cannot afford not to have computers (Stubbe, 1981, p. 30).

Brooks and Behling (1978, p. 22) state that "with the wide scope of applications available through the use of a minicomputer that can fit almost every businessman's budget, there is little doubt that minicomputers systems will have a profound impact on the American business scene." Miller (1980, p. 58) states some statistics by International Data Corporation which predicts that "by year-end 1983, about 2.6 million desk-top computers will be installed in the US, with worldwide installation hitting 3.9 million units." Taylor (1981) indicates that sales of small computers are increasing at a rate of 50% to 60% per year, and that the vast majority of peronsal computers are being bought by small businessmen. Due to the increasing availability of relatively inexpensive computer power for the small business, it appears important

to assess the impact of this computing power upon the working environment of the small business and the implications which it holds for business education programs.

It is also important to determine the number and types of employees whose jobs are being affected by the use of microcomputers, minicomputers, and small computers in small businesses.

> By 1990, as many as one in five of the United States labor force will require some knowledge of data processing. In addition, by that year more than six out of ten in the United States labor force will depend in some way on data processing (McCarter, 1978, p. 99).

Nord (1980, p. 15) states that "the U. S. Department of Labor recently indicated that 50 percent of the work force is involved in data handling." This study will provide information on those data processing employees currently in small businesses and also employment trends for the next five years.

In the Delta Pi Epsilon Research Bulletin No. 5, Needed Research in Business Education, Dr. Don Reese of the University of Tennessee (1979, p. 11), states the following for needed research in data processing: "Can the utilization of automated equipment in the office and their specific operations in varying sizes of business firms be identified?" This study will specifically look at the utilization of microcomputers, minicomputers, and small computers in small businesses, as well as computerized business applications in small businesses.

Definition of Terms

There is a wide variety of definitions for minicomputers, microcomputers, and small computers because of the microelectronic technology blurring the lines of separation between the sizes of computers. For

the purposes of comparison in this study, minicomputers, microcomputers, and small computers will be defined as follows:

Microcomputer. A microcomputer is a small desk-top system which has minimum primary memory storage of 4K bytes, has a limited capacity for input/output devices, and costs less than $5,000. (See Table I for cost comparisons).

Minicomputer. A minicomputer is a small free-standing computer system which usually has minimum primary memory storage of 48K, a minimum of one input/output device with the capacity to add additional input/output devices, and costs less than $20,000. (See Table I for computer cost comparisons).

Small Computer. A small computer is the small end of the large mainframe computers. It usually has a minimum of 64K bytes of primary memory storage, has multiple input/output devices, and costs less than $100,000. (See Table I for computer cost comparisons).

TABLE I

COMPUTER COST COMPARISON TABLE

	Approximate Cost	Approximate Monthly Rental
Microcomputer	$500 - $5,000	$50 - $200*
Minicomputer	$5,000 - $20,000	$200 - $400
Small computer	$20,000 - $100,000	$400 - $2,000

*Usually purchased, not leased

Source: Silver and Silver, 1981, p. 67.

Desk-top Computer. Miller (1980, p. 58) states that "the most basic definition is a computer that sits on a desk." A desk-top computer could be a microcomputer or a minicomputer.

Small Business Computer. The term small business computer could refer to either a microcomputer, minicomputer, or small computer.

It should be noted that definitions for computers are usually outdated as soon as they are published due to the rapid growth of microelectronic technology today. Therefore, the above definitions are used to give an approximation of the difference in sizes of computers.

Other definitions relevant to this study are:

BASIC (Beginner's All-Purpose Symbolic Instruction Code). An interactive programming language which is easy to use and learn. It is machine independent and is a terminal-oriented language. It was developed in the pattern of the FORTRAN language, and is one of the primary languages used on microcomputers and minicomputers.

Business Applications. Those applications which are used by businesses to maintain records as well as other revenue-producing and management applications. These business applications can include but are not limited to: sales forecast and control, payroll, order point calculation, word processing, business management, accounting, personnel management information, cost accounting, manufacturing information control, banking and credit, and modeling and planning (Silver and Silver, 1981).

Byte. A group of bits (electronic pulses) that form a character.

COBOL (COmmon Business Oriented Language). Is a problem-oriented language used extensively in business and industrial programming. It resembles ordinary business English, has excellent literal capability

and file handling techniques, is machine independent, and is a very verbose programming language.

Computer Hardware. The actual machines or physical equipment which are used to process data.

Computer Service Bureau. A company which sells data processing services.

Computer Software. The programs, procedures, and computer languages used in data processing.

Data Entry Clerk. A person who enters data into terminals for transmission to the central processing unit.

Data Processing Manager. Manager of a data processing center or the data processing function of a business.

Dumb Terminal. A terminal which can only transmit or receive data from a central processing unit.

FORTRAN (FORmula TRANslating System). Is a problem-oriented language with a high-level of mathematical capabilities, is relatively compact, bears a close resemblance to mathematical notation, and good literal capabilities.

In-house Data Processing. A computer system which is owned and/or leased by the business and is operated and maintained by that business.

Intelligent terminal. A terminal which contains a microprocessor and can manipulate data as well as input and output it to a central processing unit.

K Bytes. One thousand bytes.

Megabyte (MB). One million bytes.

Operator. A person who manipulates the controls of a computer, loads and unloads input/output devices, starts the machine, etc.

PASCAL. Is a heirarchical language that is self-documenting, is relatively easy-to-learn, and is very efficient in computer usage. It lacks standardization, and has limited file handling capabilities.

Peripheral Equipment. Various types of machines that can be used with a computer but are not part of the actual computer itself, such as card readers, line printers, console typewriters, terminals, and others.

PL/1 (Programming Language 1). Was developed by IBM as a multipurpose language for business and scientific uses, is suitable for both terminal and batch processing, and is a proprietary language so it is used only on IBM computers.

Programmer. A person who prepares programs for a computer.

Programming Language. The language used to program a computer.

RPG (Report Program Generator). Is a language with the primary purpose being to prepare business reports on small computers. It is easy to learn, is designed to facilitate processing, updating, and maintaining large data files, is not standardized, and is machine dependent.

Small Business. For the purpose of this study, a small business will be defined as any business with less than $25 million in annual sales.

System Analyst. A person who is responsible for the planning, design, and implementation of a business system.

Time-sharing. A computing technique in which numerous terminal devices can simultaneously use a central computer for input, processing, and output functions (Sippl, 1972).

Limitations

This study is being limited to only microcomputers, minicomputers, and small computers in small businesses. The utilization of medium and large computers in business is not part of the study, as well as the usage of microcomputers, minicomputers, and small computers in medium and large businesses.

The study is also limited geographically to the following states: Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, Minnesota, South Dakota, North Dakota, Nebraska, Louisiana, Kansas, Arkansas, Oklahoma, and Texas. The survey was sent to only those small businesses in each state which were listed in Dunn and Bradstreet's Million Dollar Directory (1982), and had annual sales of $25 million or less.

CHAPTER II

REVIEW OF RELATED LITERATURE

Since the first electronic computer was developed in 1943, computers have continued to increase in speed and decrease in cost. Below is a list of events from a chart Computing Through the Ages, written by Schadewald (1981), which has resulted in the small computer revolution being experienced by the world of business today:

1943 ENIAC (Electronic Numerical Integrator and Computer) built at the University of Pennsylvania. The first general-purpose computer, it contained over 18,000 vacuum tubes and was hundreds of times faster than any previous machine. At first programmed by unplugging and rearranging patchcords, it was later converted to punched-card control.

1948 J. Bardeen, W.H. Brattain and W. Schockley invented the the transistor effect.

1951 J.P. Eckert and J. Mauchly, who were largely responsible for ENIAC, delivered their first UNIVAC to the U.S. Census Bureau--the first general-purpose computer bought by the government.

1954 IBM introduced the 704 scientific computer and 705 data processing computer.

1959 IBM introduced their transistorized computers, the 1620 for scientific calculations, and the 1401 for data processing.

1965 Integrated circuits--many components on a single piece of semiconductor--were introduced.

1969 The four-function pocket electronic calculator was introduced for $425. Neil Armstrong and Edwin Aldrin landed on the moon, a feat made possible by the speed and number-crunching power of their navigational computers, both on board and on the ground.

1971 Intel introduced the first microprocessor chip, the 4004. It was used in industrial-process controllers, point-of-sale terminals, and the like.

1974 Error-correcting codes, which sense erroneous "blips" caused by cosmic rays and the like and automatically correct them, introduced by Control Data Corp.

1974 Intel introduced the 8080 microprocessor chip, the eight-bit processor that launched the microcomputer revolution. It was followed soon afterward by Motorola's 6800.

1974 MOS Technology introduced the 6502 microprocessor chip, the "brain" of many top microcomputers today.

1975 The Altair 8800, the first production microcomputer, was introduced in January, using the Intel 8080 chip.

1976 The first Cray 1 computer, made by Cray Research, was shipped. It was the fastest computer in the world, with a "cruising speed" of 80 million floating operations per second.

1976 Zilog came out with the Z80 microprocessor chip, chief rival of the MOS 6502.

1977 First personal computers--from Apple, Radio Shack and Commodore--went on the market.

1977 First color graphics in a microcomputer introduced by Apple Computers.

1979 VisiCalc, probably the most significant piece of business software in the decade, was brought out by Personal Software. Many businesses now buy microcomputer hardware so they can use the VisiCalc software.

1980 The pocket computer is introduced for under $250. Literally pocket-sized, its power is comparable to ENIAC and it has more memory.

1981 Intel introduced the first micromainframe computer.

1981 During this year, someone delivered the 250,000th microcomputer sold in the United States (pp. 27-29).

The microprocessor and resulting microcomputers and minicomputers have only been developed in the decade of the 1970's. As a result of the microelectronic technology, an information explosion is affecting all of our lives, both personal and business. Lusa (1980, p. 40) states

"once a microprocessor that incorporates more power in the space of a pin head than the first commercial computer offered is added, a phenomenon is underway that touches every consumer's life." Dock and Essick (1981) state the following about the effects of microelectronics:

> The development of the microcomputers began in 1971 when the first computer processor based on microelectronics was introduced. Since that time there have been a number of improvements in the microcomputer, and it has had a tremendous impact on the computer industry. Today over 30 active manufacturers are offering some 50 different models. It is predicted that by 1983 over 2.6 million units will have been installed. A microcomputer uses a processor that is from 100 to 1000 times smaller than comparable central processing units built in 1970. Its primary advantage besides size is its low cost in comparison to other processors (p. 215).

Lusa (1980) states the following about the effect of computers in our lives:

> No less an authority than a former US president declared: 'No industry will be bigger in the next 50 years or reach further into the lives of American business people or consumers than communications and information processing technology.' That was Gerald Ford speaking to a group of DP practitioners at a management conference sponsored by MSA Inc. in New York City last fall. A noted social scientist, Dr. Anthony J. Weiner, a professor at New York's Polytechnic Institute and co-author of a futurist book, pointed out at the same conference that 'the current and prospective growth of information technology is the most important development society has experienced since the automobile, the cotton gin and the steam engine' (p. 40).

Microcomputers, minicomputers, and small computers all can be defined as small business computers. The definitions are often hazy and the microprocessor technology has made microcomputers act like minicomputers, minicomputers act like small computers, and small computers act like medium and large mainframe computers. What makes microcomputers, minicomputers, and small computers different? Schadewald (1981) states the following:

> Exactly what is a microcomputer? Well, it's a small computer that's not a minicomputer. It's not easy to be more specific. Once upon a time, computers could be categorized roughly as

> follows: If it took an elephant to carry it, it was a 'mainframe' computer. If two burly men could carry it, it was a 'minicomputer.' If you could carry it under your arm, it was a 'microcomputer.' Miniaturization and other factors have since blurred both size and cost distinctions, but generally, minicomputers are still made by old-line companies and are physically bigger, more expensive and more powerful than microcomputers. A microcomputer is a small, relatively low-cost computer the brain of which usually fits on a chip of silicon less than a centimeter square (p. 20).

Himrod (1979, p. 44) states that "the unique features of the microcomputer are its small size (roughly six cubic feet) and its low cost. It is the low-cost feature which makes this new advance in technology revolutionary for the small business world." Schadewald (1981) states:

> It's difficult to compare microcomputer systems. Some package the keyboard, CRT, computer and disk drives in a single unit; others sell all the parts separately, like the components of a stereo system. Prices, too, vary according to capability, sophistication and ruggedness, as well as factors of the marketplace. A typical business system--a computer with 48K of memory, a CRT, one or two floppy-disk drives and a printer--will generally retail for between $4,000 and $10,000. Adding a five-megabyte (three drafts of War and Peace) hard-disk system might cost another $5,000 (p. 20).

Tomczyk, director of marketing for Commodore Business Machines, states the following:

> Four things are going to happen in the next two years that are going to have a tremendous impact on the business-computing field in general, and it will come from the microcomputer area. First, microcomputers are going to be challenging minis in power, utilization and especially in price/-performance. Second, micros are going to provide much more memory, both internally and externally, than they currently provide. Third, the price of that (memory) power is going to come down significantly. Fourth, part of this expansion of memory will be marriage of videodisk technology and microcomputer technology. That's already happening today (Schadewald, 1981, p. 31).

The impact of microcomputers in business is and will continue to be significant because of their increased power and decreased cost. Schadewald (1981, p. 19) states that "one industry projection suggests that

within the next five years microcomputer usage by small businesses will increase by about 400 percent."

Minicomputers are also greatly affecting business. Musselman and Smith (1979) state the following:

> More and more of America's businesses are processing their financial data by means of electronic computers. Projections of increased sales of minicomputers to small businesses and professional firms indicate that computerized recordkeeping is increasing in popularity. According to a recent article in the Wall Street Journal there are 260,000 minicomputers in use now and it is estimated that sales will reach 115,000 units annually by 1980. Even people who are not employed in firms using electronic computers cannot avoid the fact that the computer is part of life's financial transactions (p. 34).

Seymour (1978, p. 17) states that "a rigid definition of minicomputers cannot be given since the nature of the computer industry is ever changing." Seymour (1978) uses Auerbach's definition:

> A minicomputer is a small, stored-program digital computer that can be programmed in an assembly or higher-level language and which has the following attributes.
>
> 1. Sells for less than $25,000 for a minimum, stand-alone configuration comprised of a central processing unit, memory, input/output equipment, and systems software.
> 2. Contains a memory of at least 4,000 eight-bit words.
> 3. Performs normal computer functions (inputs, transfers, stores, processes, and outputs data) under stored-program control.
> 4. Is usable in a broad range of applications (p. 17).

Minicomputers have several advantages which include cost, flexibility, set-up, and speed of processing, but there are also drawbacks which include software, cost of peripherals, and maintenance (Seymour, 1978).

Bromberg (1978) gives the following definitions of minicomputers:

> 1. An average minicomputer has a core memory size that ranges from 10K to 128K bytes. Physically, the size of these minicomputer cpu's range from a table-top to one approximating a large four drawer file cabinet.

2. In addition to the central processing unit, a minicomputer system includes peripheral units such as disk or tape devices and high-speed printers. There will also be from one to a dozen or so terminals, through which the human interface with the computer is accomplished.

3. A more manageable definition of a minicomputer is that it is a machine developed primarily for the processing of a single application or the processing of a number of small applications.

4. Probably the single distinguishing feature of a minicomputer is its price. Today, minicomputers can be purchased from $10,000 to $200,000 depending upon capacity and peripheral requirements (p. 101).

Minicomputers provide small business with access to business records on a timely basis for decision-making purposes. It gives managers modeling capabilities to prepare forecasts and projections which were never available to the small business before. Bromberg (1978, p. 102) states that "in short, the age of minicomputers will provide the small businessman the same efficiencies and cost savings that up to now were available only to much larger organizations."

Besides microcomputers and minicomputers, there are small computers which are the small end of the mainframe computers. Dock and Essick (1981) state:

> A small computer system typically includes a general-purpose digital computer with a storage capability slightly larger than that of a minicomputer. It can support a variety of input/output devices. There is a wide price and performance range within small computer systems. Small computers usually have from 64,000 to 500,000 bytes of main storage, and use from 20 to 100 megabytes of secondary storage (p. 207).

Silver and Silver (1981) define a small computer system as having a 16K-byte or larger memory system, can include card readers, magnetic disk storage, and medium-speed printers capable of printing approximately 125 lines per minute, and are used by small business firms, manufacturing companies, schools, financial institutions, and governmental agencies.

The term small business computer is used for microcomputers, minicomputers, and small computers.

> Typical small business computer hardware includes four basic pieces of equipment. The Central Processing Unit coordinates and controls the operation of the system. Information is entered into the system through the typewriter-like keyboard of the Video Display Workstation. Needed information and files are stored in the Disc Memory. Reports and data produced by the system can be displayed on the video screen or put on paper by the Printer, which is also the source of output documents like invoices, statements, and packing lists (Small Business Computers, 1980, p. 22).

Perry (1980) states the following:

> Nearly 100 vendors offer some 300 makes of computers, ranging in prices from $100,000 down to a few thousand dollars. A study last year by Rexon Business Machines Corp. showed that the average prices for a small business computer with more than one work station (terminal) was $43,000. The average prices for a smaller system, according to a study by Pertec Computer Corp., is about $18,000. The more expensive systems are directed at companies with annual revenue of $25 million or more. The very low-priced systems are aimed at an estimated 1.2 million firms with sales of less than $500,000 annually. Finally, industry figures show an untapped market for 1.5 million small business systems (p. 40).

Perry (1981) also gives his definition of a small business computer:

> In its most simple configuration, a small business computer consists of a central processor, a cathode-ray tube (CRT), a keyboard for entering data, a disk for storing files and a printer for hard-copy output. The size of the memory in the central processor ranges widely, from 4,000 to more than 512,000 characters (p. 40).

Rhodes (1980) states that:

> there is no 'truly satisfactory' definition of a small business system, says Gerald C. Chichester, president of Focus Research Systems Inc., West Hartford, CT, which published a report on the subject this year. Definitions usually entail a discussion of computer hardware combined with certain software or programming capabilities (p. 42).

Murach (1977, p. 416) states "when does a minicomputer become a small business computer? When it costs more than $50,000."

> An increasing number of minicomputer manufacturers are making systems specifically designed for small businesses. These manufacturers commonly call the systems 'small business computers'. The small business system may contain a minicomputer or a microcomputer, but it is still referred to as a small business computer (Dock and Essick, 1981, p. 212).

Small business computers, whether they be a microcomputer, minicomputer, or small computer, are used in a variety of ways in business.

Kroenke (1981) states:

> Microcomputers are commonly used in business for three reasons. They are used as the hardware component of business computer systems; they are used to provide intelligence in products; and they are used to control the operation of sophisticated input/output equipment (p. 458).

Smolenski (1981) states the following about the uses of a microcomputer:

> Business people who buy microcomputers often justify their systems based on one or two key initial applications from which they expand into other areas. A recent survey of small business computer users shows that mailing lists, payroll, accounts receivable/payable, and invoicing/billing are the most common initial applications. Tight economic conditions and declining sales have also increased the need for automated inventory and sales analysis systems. Microcomputers are especially good for those tasks which are clerical in nature, repetitive, have a large volume of transactions associated with them, and are time-consuming (p. 14).

Himrod (1979) states:

> Applications of the microcomputer that can aid the small business manager include the following:
>
> General accounting, such as the general ledger, payroll by pay period and year to date, accounts receivable with aging schedule, accounts payable, inventory, etc. can be compiled and maintained.
>
> Cost accounting data such as incremental costs, historical costs, job order costing and continuous process costing can be computed.
>
> Tax return data can be compiled and stored for use at year-end. Customer listings for advertising campaigns can be stored and subsequently recalled by a predetermined criteria such as area.
>
> Maintenance schedules for machinery and/or vehicles can be tracked on a daily basis.

> Contractor bids can be computerized so that only the variable information need be inserted for each bid proposal.
>
> Trend data and statistical data can be compiled and used as a management tool (p. 44, 48).

Minicomputers also have a variety of uses.

> Businesses use minicomputers in several ways in addition to process control applications. These include: (1) replacement of manual or mechanical data processing systems; (2) remote data entry devices to large computers; (3) replacements for a large computer; and (4) to supplement a large computer (Dock and Essick, 1981, p. 211).

Seymour (1978, p. 18) states that "minicomputers are used in five broad application areas: industrial process control, peripheral control, computation, data acquisition, and communications."

Summary

Microcomputers, minicomputers, and small computers will continue to have an impact on small businesses due to their variety of applications and low cost. Nord (1980) states the following:

> The trend toward increased computer usage is projected to continue through future decades. The impact of low-cost computer systems with the pre-transaction figure constantly spiralling downward will add further emphasis to the information processing explosion. Information technology includes the construction of machines that exhibit much of what we have previously defined as 'intelligence' machines that can truly be said to learn and machines that not only respond undoubtedly pose problems as well as numerous opportunities and advantages. With labor/personnel costs rising at the inflationary level, business becomes more and more entrenched with the idea of 'replacing' humans with machines (p. 15).

Bromberg (1978) states:

> Perhaps the most extraordinary effect of the minicomputer revolution is the influence these machines are having on small businesses and small businessmen. To establish a common point of view, I categorize small businesses as those organizations with annual revenues of between $500K and $10 million. By far, the major impact of these minicomputers will be experienced by those small businesses which are new to the concept of data processing. It is a great leap forward (p. 102).

Himrod (1979) states:

> Other factors which will spur the use of computers by small business are the increased information requirements of regulatory agencies, competition during periods of inflation, and the increasing sophistication of corporate data processing systems. At least one computer industry magazine has estimated that 80 percent of the computers built during the 1980's will be sold to small businessmen (p. 44).

A review of the literature has shown that small businesses are being affected by the rapidly changing technology currently taking place in the computer industry. Therefore, it is important to assess the effect of microcomputers, minicomputers, and small computers on small businesses.

CHAPTER III

RESEARCH DESIGN AND PROCEDURES

The following steps were used in researching the problem, planning the study, conducting the survey of small businesses, and presenting the results of the study on the utilization of microcomputers, minicomputers, and small computers by small businesses:.

1. Review of related literature
2. Development of the research questionnaire
3. Preparation of the cover letter and follow-up letter
4. Selection of the sample
5. Collection of the data
6. Analysis and interpretation of data
7. Presentation of conclusions and recommendations.

This study was designed as a descriptive study in order to obtain data from small businesses concerning their utilization of small computers, primarily microcomputers, minicomputers, and small mainframe computers. Data was obtained from the respondents concerning the type and size of their business, whether or not they utilized any type of data processing capabilities, what types of in-house data processing capabilities their firm had, or if they intended to purchase in-house data processing capabilities in the near future. Through the descriptive data obtained from the returned questionnaires, it was possible to tabulate the number of firms by type and size which do and do not utilize

data processing. For firms which have in-house data processing capabilities, the data will indicate the type of computer hardware, software, and applications used by particular types and sizes of small businesses, as well as the types of data processing employees.

This chapter describes the research design by elaborating on each of the steps employed in completing the study.

Survey of Related Literature

The available professional publications and literature relating to business education and business data processing were examined to determine if similar studies had been made and to review the literature concerning the use of small computers by small businesses. Sources used were the Business Education Index (1976, 1977, 1978, 1979, 1980, 1981, 1982), the Index to Doctoral Dissertations in Business Education 1900-1975 (1975), Research: Process and Product (1977), Needed Research in Business Education (1979), Guide to Research in Business Education (1976), Design and Conduct of Educational Surveys and Experiments (1977), an on-line search of a business data base by the Oklahoma State University Library, and numerous professional journals and computer magazines.

The researcher examined the literature from the 1970's to the present, but was primarily interested in the literature published since 1975, which was the year that the first microcomputer was manufactured. The microcomputer is one of the reason's for the current changes taking place in the data processing capabilities of small firms today, and the resulting explosion of data processing technology is affecting all of society.

The review of literature was helpful and informative, even though there were no studies found, published at this time, which dealt primarily with the use of small computers by small businesses.

Development of the Research Questionnaire

The research instrument designed to gather data for this study was a four-page questionnaire developed through a review of the literature and of similar questionnaires used to obtain data from businesses, and through consultations with Oklahoma State University faculty members.

The questionnaire went through numerous revisions by the researcher as it was reviewed and critiqued by numerous faculty members and graduate students at Oklahoma State University. A pilot study was conducted in Stillwater, Oklahoma; sending it to local businesses which had sales under $25 million and were listed in Dun and Bradstreet's Million Dollar Directory (1982). A copy of the piloted questionnaire and cover letter is included in Appendix A. The response rate to the pilot study was 37.5 percent. After the piloted questionnaires were returned, the questionnaire was again revised and critiqued by Oklahoma State University faculty members. Every effort was made to develop a questionnaire that was easy to follow and complete, was not longer than four pages, and had questions that were clearly stated and not ambiguous.

The final questionnaire was printed on both sides of 11 x 17 paper and folded in half to make the final size of 8 1/2 x 11 inches. It was printed on bright green paper so that it would not be put aside and forgotten by the person receiving it and possibly result in a better response rate. (See Appendix B for a copy of the final questionnaire.)

The questionnaire did not require a signature or name of the company in order to protect the anonyminity of the respondents. However, an identification number was used only for the purposes of the researcher in order to facilitate a follow-up mailing.

The questionnaire was divided into three sections:

I. General Information -- Company Profile

II. Computer System Information (Hardware)

III. Business Applications and Software.

Section I was to be completed by all respondents, whereas Sections II and III were to be completed by only those respondents which had in-house data processing capabilities (see definitions, page 7). Section I of the questionnaire contained questions designed to obtain a profile of the company, including primary business purpose, annual gross revenue, number of employees, and whether the firm utilized any data processing capabilities, and if so, what types of data processing. Section II of the questionnaire was designed to obtain information on the computer system utilized by the firm, including the computer manufacturer, model number, number of bytes of primary storage, and the number of each type of peripheral equipment currently utilized. This section also contained two questions on the present and future number of data processing employees in the firm. Section III of the questionnaire was designed to obtain the types of business applications initially on the computer system, currently on the system, and anticipated to be on the system in the future. It included the source of the programs for the business applications on the computer system, and the primary and secondary programming languages used on the system.

The questionnaire was designed in a manner that would facilitate the completion of it by the respondents and for ease in tabulating by the researcher. Questions were concise and to-the-point, and were consistent in data processing terminology. The questions were attractively placed on the page, and professionally printed to give it a business-like appearance.

Preparation of the Cover Letter and Follow-up Letter

The cover letter was developed with much thought and care in order to encourage the businesses receiving it to participate in the study by completing and returning the questionnaire. The cover letter was written in the form and style of a business letter, and was concise but explanatory. The letter was reproduced on College of Business Administration, Oklahoma State University, stationery, and was co-signed by the dissertation advisor, Dr. G. Daryl Nord. The advisor's signature was reproduced on the letter, but the researcher signed each letter individually. (See Appendix C for a copy of the cover letter.)

The follow-up letter was also written to be explanatory, to-the-point, and in a business format. It contained much encouragement for the businesses to complete and return the questionnaire as soon as possible, and was written to be appealing to even the most disinterested business in order to solicit a response. The follow-up letter was also reproduced on College of Business Administration, Oklahoma State University stationery, and was co-signed by the dissertation advisor, Dr. G. Daryl Nord. Again the advisor's signature was reproduced on the letter, but each letter was signed individually by the researcher. (See Appendix C for a copy of the follow-up letter.)

Selection of the Sample

The researcher used the following 16 states from which to select 31 businesses from each state: Indiana, Illinois, Michigan, Wisconsin, Ohio, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Arkansas, Louisiana, Oklahoma, and Texas. These 16 states form the following three regions as defined by the Statistical Abstract of the United States (1980): East North Central (Ohio, Indiana, Illinois, Michigan, and Wisconsin), West North Central (Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas), and West South Central (Arkansas, Louisiana, Oklahoma, and Texas). By using regions defined by the Statistical Abstract of the United States (1980), it would be possible to compare statistics for the regions if so desired by the researcher.

Dun and Bradstreet's Million Dollar Directory (1982) was used to obtain the names and addresses of the businesses to be used in the sample. This directory contains three volumes, and lists over 120,000 businesses which have more than $500,000 in assets. Volume I of the directory contains approximately 49,000 business which have the largest amount of assets. The remaining businesses are listed in Volumes II and III, each containing approximately 36,000 companies. Only those businesses which were listed as having sales under $25 million were used in this study.

Each volume of the directory contains an alphabetical listing, a geographic listing by state, and a listing by standard industrial classification code. As this study was geographically limited to small businesses in 16 states, the geographically listing was used to randomly select 31 businesses from each state. A computer program was written by

Dr. William Warde of the Department of Statistics, Oklahoma State University, to randomly pick a volume number, page number in that volume, column number on that page, and entry number for that column. Each full page of the geographical listing for each state contained three columns and 29 entries in each column, with each entry either being the name of a city or the name and address of a business. If the particular entry selected was the name of a city rather than a business, it was not used. After the valid business entries were selected from the geographic listing, the alphabetic listing was checked to determine the sales volume of each business. If the sales were over $25 million or were listed as not available, that business was deleted from the sample.

The computer program also provided an order number for each selection, which gave the order in which the entries were randomly selected. This order number was used if more than 31 valid businesses were found from a state, and then those businesses with the highest order number were deleted from the sample.

Approximately 85 random entries had to be selected in order to arrive at a sample size of 31 businesses for each state. This was particularly true of the smaller, rural states like South Dakota, North Dakota, and Nebraska. After the 31 businesses were selected for each state, the names and addresses were entered into a data set. A Statistical Analysis System (SAS) program was written to print the labels for the envelopes from the data set. The data set also contains the identification number for each state, and another SAS program was written by the researcher to print a computerized listing of the sample for each state in identification number order.

Collection of the Data

The mailing envelopes used for mailing the cover letter, questionnaire, and return envelope were professionally printed with the researcher's return address. The return envelopes were also professionally printed with the researcher's mailing address. Both the mailing envelopes and the return envelopes were stamped with commemorative stamps, as a number of advertising and marketing studies have shown that a slightly higher reponse rate can be achieved by using commemorative stamps. The researcher also wanted to use first-class postage to insure fast delivery and return of the questionnaires.

The timetable for the original and follow-up mailings were as follows:

1. Original mailing -- May 12, 1982
   Date requested for return -- May 23, 1982

2. Follow-up mailing -- May 26, 1982
   Date requested for return -- June 4, 1982

There were 249 questionnaires returned from the 496 businesses contacted for a 50.20 percent reponse rate. Of those questionnaires returned, only 229 were usable which was a 46.17 percent usuable response rate. Unusable returns resulted from a business indicating they had over $25 million in annual gross revenue, or the questionnaire was returned blank. An analysis of the returns and non-returns is reported in Table II.

Analysis and Interpretation of the Data

As the questionnaires were returned, the responses were coded and entered into a data set. A SAS program was used to tabulate the responses from each questionnaire, and to reveal the frequencies and

percentages of each response for each question. The questionnaires were divided into two groups: those who did not have any in-house data processing capabilities and those that did. The tabulation of the data collected is shown in table form in Chapter IV. The interpretation of the tabulated data, as well as supplementary information, resulted in the findings which are also reported in Chapter IV.

TABLE II

DISTRIBUTION OF RETURNS AND NON-RETURNS OF THE SAMPLE

Category	Number	Percent Total (N=496)
Total businesses in sample	496	100.00
Total business thought to have been contacted	494	99.60
Total businesses with bad addresses not contacted	2	0.40
Total respondents from original mailing	220	44.35
Total respondents from follow-up mailing	29	5.85
Total respondents	249	50.20
Total usable returns	229	46.17
Total non-usable returns	20	4.03
Total non-respondents	247	49.80

Presentation of Conclusions and Recommendations

On the basis of the findings reported in Chapter IV, conclusions and recommendations were made which are included in Chapter V.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

The study questionnaire was sent to 31 small businesses, randomly selected from Dun and Bradstreet's Million Dollar Directory (1982), in each of the selected 16 states. The data gathered concerns the utilization of small computers by small businesses. The findings resulted from a detailed analysis of the responses to the questionnaire.

Method of Analyzing the Data

Section I of the questionnaire was designed to obtain a profile of the company. Specifically, the questions concerned the primary business purpose of the firm, the annual gross revenue, the number of employees, whether or not the firm utilizes data processing, whether or not they intend to purchase in-house data processing capabilities if they do not currently utilize data processing, and what types of data processing capabilities their firm does use.

Sections II and III of the questionnaire were designed to give the researcher a more detailed picture of each firm's in-house data processing capabilities, and was only completed by those firms that had the capability. Specifically, Section II contained questions concerning the model and size of the computer system, the purchase price and/or monthly lease payments of the computer system, the types of peripheral equipment utilized, the types and number of data processing employees, and the

types and number of data processing employees the firm intends to employ in the next five years. Specifically, Section III contained questions concerning the types of business applications which were computerized initially, are computerized currently, and are planned for future computerization; the source of the business application programs, and the primary and secondary programming languages used on the computer system. The clarification of "other" responses was allowed for in all sections of the questionnaire. The questionnaire is in Appendix B.

A Statistical Analysis System (SAS) program was written by the researcher to tabulate the responses of each item in the questionnaire. The results from each response to a question were tabulated according to frequency of occurrence, cumulative frequency, percentage, and cumulative percentage. The specific findings may be found in the various tables in the following discussion.

Data Analysis

Responses were received from small businesses in each of the 16 states surveyed. There were 20 questionnaires returned which were not usuable for the following reasons:

1. Thirteen questionnaires listed annual gross revenue of over $25 million which did not meet the study's criteria for a small business.

2. Four questionnaires were returned because the companies indicated they were no longer in business.

3. Two questionnaires were returned blank because the companies indicated they did not use computers.

4. One questionnaire was returned blank because the company indicated that it did not have time to "mess" with it.

There were 229 questionnaires which were completed and were used for the analysis of the data, which is divided into four sections: an analysis of the respondent's company profiles; an analysis of the types of data processing utilized; an analysis of the in-house data processing capabilities utilized; and an analysis of the types of business applications software used by those firms having in-house data processing capabilities.

The first section on the analysis of the responsdents is subdivided into five areas: primary business purpose, annual gross revenue, number of employees, state of residence, and regional affiliation. Each area was analyzed using frequencies and percentages.

The second section on the analysis of the types of data processing capabilities is sub-divided into three areas: utilization of data processing, status of consideration to purchase in-house data processing if the firm does not currently utilize any type of data processing, and the types of data processing capabilities utilized. Each area was analyzed using frequencies and percentages.

The third section on the analysis of in-house data processing capabilities is sub-divided into five areas: model and size of hardware, purchase prices and/or monthly lease payments of the computer system, types of peripheral equipment used, types of data processing employees currently employed, and types of data processing employees needed in the next five years. Each area was analyzed using frequencies and percentages.

The fourth section on the analysis of the types of business applications and software used is sub-divided into six areas: type of business applications used on the computer system initially, types of business applications used on the computer system currently, types of

business applications to be used on the computer system in the future, the source of business application programs, the types of primary programming languages used, and the types of secondary programming languages used. Each area was analysed using frequencies and percentages.

Finally, various items of the questionnaire were compared with the primary business purpose and the annual gross revenue utilizing two-way tables and the chi-square test for significance. The utilization of data processing and the use of current business applications was compared with four groups of primary business purposes (retailing, manufacturing, wholesaling, and "other") and three groups of annual gross revenue (less than $3 million, $3-$9.99 million, and $10-$24.99 million). Other comparisons were attempted, but the results were not significant and/or there was not enough data for a valid chi-square test of significance.

Analysis of the Business Respondents

This section presents an analysis of the types of businesses that responded to the questionnaire as well as their state and regional affiliation. The questionnaire contained one question for each of the following areas: primary business purpose, annual gross revenue, and number of employees. See Appendix B for the complete questions. The state and regional affiliation was obtained from the identification number of the returned questionnaires.

Respondents were asked to indicate the primary business purpose of their firm, and a space was allowed to specify a reponse of "other". Table III represents the analysis of this question. The type of business indicated most often was retailing, with 68 respondents, or 29.69

percent, while 50 respondents, or 21.83 percent, indicated manufacturing. Wholesaling had 27 respondents, or 11.79 percent, and construction had 18 respondents, or 7.86 percent. There are 52 "other" responses listed in Table IV.

Table V contains an analysis of the annual gross revenue of the respondents. Five of the respondents left this question blank. Forty-seven of the respondents, or 20.98 percent, indicated their annual gross revenue was $5-$5.99 million, and 45 respondents, or 20.09 percent, indicated annual gross revenue of less than $1 million. The third highest level of annual gross revenue reported was $1-$1.99 million with 38

TABLE III

ANALYSIS OF THE TYPES OF BUSINESSES

Type of Business	Frequency	Cum. Freq.	Percent	Cum. Percent
Retailing	68	68	29.69	29.69
Manufacturing	50	118	21.84	51.53
Wholesaling	27	145	11.79	63.32
Construction	18	163	7.86	71.18
Printing & Publishing	5	168	2.18	73.36
Insurance	5	173	2.18	75.54
Transportation	4	177	1.75	77.29
Other	52	229	22.71	100.00

TABLE IV

TYPES OF PRIMARY BUSINESS PURPOSES THAT WERE NOT LISTED ON THE QUESTIONNAIRE BUT SPECIFIED UNDER "OTHER"

Primary Business Purpose	Frequency
Recreation	1
Grain Merchandising	6
Farming	9
Electric Utility	4
Motel and Restaurant	2
Sheet Metal Works	1
Rental Property	1
Communications and Cable Television	4
Real Estate Appraisal	2
Concrete Ready Mix	1
Equipment Repair	1
Telephone Company	1
Bowling Lanes	1
Agriculture Service and Rental	1
Steamshop Agents and Stevedores	1
Coin Laundry	1
Investments	1
Oil Well Servicing	1
Civil Engineer Consultant	1
Accountant	1
Management Service	4
Computer Center	1

TABLE IV (Continued)

Primary Business Purpose	Frequency
Steel Distributor	1
Advertising Specialties	1
Oil and Gas Exploration	2
Wool Marketing	1

TABLE V

ANALYSIS OF THE ANNUAL GROSS REVENUE

Annual Gross Revenue	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than $1 Million	45	45	20.09	20.09
$1-$1.99 Million	38	83	16.96	37.05
$2-$2.99 Million	29	112	12.95	50.00
$3-$3.99 Million	13	125	5.80	55.80
$4-$4.99 Million	16	141	7.14	62.94
$5-$9.99 Million	47	188	20.98	83.93
$10-$14.99 Million	25	213	11.16	95.09
$15-$19.99 Million	7	220	3.13	98.21
$20-$24.99 Million	4	224	1.79	100.00
Did Not Respond	5	229	-	-

respondents, or 16.96 percent. Twenty-nine respondents (or 12.95 percent) indicated annual gross revenue of $2-$2.99 million, and 25 respondents (or 11.16 percent) had an annual gross revenue of $10-$14.99 million. Exactly half of the repondents, 112 (or 50.00 percent) had annual gross revenue of less than $2.99 million, and over three-fourths of the respondents, 188 (or 83.93 percent) had annual gross revenue of less than $9.99 million. Thus the majority of respondents were quite small businesses.

Table VI contains an analysis of the respondents by the number of employees in their firm. Fifty-eight of the respondents (or 25.44 percent) had between 10 and 25 employees, and 56 of the respondents (or 24.56 percent) had less than 10 employees. Forty-eight of the respondents (or 21.05 percent) had between 26 and 50 employees, and 22 respondents (or 9.65 percent) had between 51 and 75 employees. Again, there were exactly half of the respondents, 114 (or 50.00 percent) that had 25 or less employees. Over three-fourths of the respondents, 184 (or 80.70 percent) had 75 or less employees. The small number of employees reported by the majority of respondents would again indicate relatively small businesses.

An analysis of the respondents by state of residence is given in Table VII. There were 18 respondents (or 7.89 percent) each from the states of Ohio and North Dakota, and 17 respondents (or 7.46 percent) each from the states of Indiana and Kansas. There were 16 respondents, or 7.02 percent, from Missouri. The least number of respondents, 10 (or 4.39 percent), came from each of the states of Michigan and Texas. One questionnaire was returned with the identification number torn from it, and was not identifiable by state or region.

TABLE VI

ANALYSIS OF THE NUMBER OF EMPLOYEES

Number of Employees	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than 10 employees	56	56	24.56	24.56
10-25 employees	58	114	25.44	50.00
26-50 employees	48	162	21.05	71.05
51-75 employees	22	184	9.65	80.70
76-100 employees	17	201	7.46	88.16
101-150 employees	12	213	5.26	93.42
151-200 employees	9	222	3.95	97.37
201-250 employees	3	225	1.32	98.69
251-300 employees	0	225	0.00	98.69
301-350 employees	0	225	0.00	98.69
More than 350 employees	3	228	1.31	100.00
Did Not Respond	1	229	-	-

TABLE VII

ANALYSIS OF RESPONDENTS BY STATE OF RESIDENCE

State of Residence	Frequency	Cum. Freq.	Percent	Cum. Percent
South Dakota	15	15	6.58	6.58
Ohio	18	33	7.89	14.47
Indiana	17	50	7.46	21.93
Illinois	15	65	6.58	28.51
Michigan	10	75	4.39	32.90
Wisconsin	14	89	6.14	39.04
Iowa	14	103	6.14	45.18
North Dakota	18	121	7.89	53.07
Minnesota	13	134	5.70	58.77
Missouri	16	150	7.02	65.79
Nebraska	13	163	5.70	71.49
Kansas	17	180	7.46	78.95
Arkansas	12	192	5.26	84.21
Louisiana	12	204	5.26	89.47
Oklahoma	14	218	6.14	95.61
Texas	10	228	4.39	100.00
Missing identification number	1	229	-	-

Table VIII contains an analysis of the respondents by their regional affiliation. As mentioned previously in Chapter III, the states used in this survey were determined by the following regions as listed in the Statistical Abstract of the U.S. (1980): East North Central (Ohio, Indiana, Illinois, Michigan, and Wisconsin), West North Central (Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas), and West South Central (Arkansas, Louisiana, Oklahoma, and Texas). Seventy-four of the respondents (or 32.46 percent) came from the East North Central region, 106 respondents (or 46.49 percent) came from the West North Central region, and 48 (or 21.05 percent) came from the West South Central Region.

TABLE VIII

ANALYSIS OF RESPONDENTS BY REGIONAL AFFILIATION

Region	Frequency	Cum. Freq.	Percent	Cum. Percent
East North Central	74	74	32.46	32.46
West North Central	106	180	46.49	78.95
West South Central	48	228	21.05	100.00
Missing identification number	1	229	-	-

Analysis of Types and Usage of Data Processing

Respondents were asked if they currently utilized any computerized data processing, and if so, what types of computerized data processing did their firm use. For those respondents which did not utilize any computerized data processing at the present time, they were asked to indicate whether or not their firm was considering the purchase of computerized data processing. See Appendix B for the complete questionnaire.

Table IX contains the analysis of the utilization of computerized data processing. One hundred thirty-seven of the respondents, or 59.83 percent, answered 'Yes' and 92 respondents, or 40.17 percent, answered 'No'.

TABLE IX

ANALYSIS OF THE UTILIZATION OF DATA PROCESSING

Utilization of Data Processing	Frequency	Cum. Freq.	Percent	Cum. Percent
Does Utilize Data Processing	137	137	59.83	59.83
Does Not Utilize Data Processing	92	229	40.17	100.00

Of the 137 respondents who indicated they do utilize computerized data processing, 102 businesses, or 74.45 percent, indicated they have in-house data processing. Table X contains an analysis of all the types of data processing utilized. Some businesses indicated they utilize more than one type of data processing, so this table has a cumulative frequency greater than the total number of respondents (137) indicated in Table IX. Of all the types of data processing utilized, 64.97 percent was in-house data processing.

Respondents were also asked to identify the number of years they had utilized each type of data processing. Table XI contains an analysis of in-house data processing utilization by the number of years utilized. The majority of respondents utilizing in-house data processing, 66 out of a total 102, had used it less than four years. Table XII contains an analysis of time-sharing by the number of years utilized. Half of those respondents using time sharing (7 out of a total 14) had used it less than six years. Table XIII contains an analysis of computer service bureau use by the number of years utilized. Slightly more than half of the respondents (19 out of a total 35) had used it less than six years. There were only six "other" types of data processing utilization indicated by the respondents, and three of these types were used less than two years. An analysis of "other" types of data processing utilized is contained in Table XIV.

An analysis of the utilization of in-house data processing by the primary business purpose is contained in Table XV. Thirty-two of the repsondents (or 31.37 percent) who utilize in-house data processing were manufacturing firms, and 24 respondents (or 23.53 percent) were retailing firms.

TABLE X

ANALYSIS OF ALL TYPES OF COMPUTERIZED DATA PROCESSING

Type of Data Processing	Frequency	Cum. Freq.	Percent	Cum. Percent
In-house data processing	102	102	64.97	64.97
Time-sharing	14	116	8.92	73.89
Computer service bureau	35	151	22.29	96.18
"Other" types	6	157	3.82	100.00

TABLE XI

ANALYSIS OF UTILIZATION OF IN-HOUSE DATA PROCESSING

Years of Utilization of In-House Data Processing	Frequency	Cum. Freq.	Percent	Cum. Percent
Used 1-2 years	32	32	23.26	23.36
Used 3-4 years	34	66	24.82	48.18
Used 5-6 years	19	85	13.87	62.05
Used 7-8 years	5	90	3.65	65.70
Used 9 or more years	12	102	8.76	74.46
Do not use	35	137	25.54	100.00

TABLE XII

ANALYSIS OF UTILIZATION OF TIME-SHARING

Years of Utilization of Time-Sharing	Frequency	Cum. Freq.	Percent	Cum. Percent
Used 1-2 years	2	2	1.46	1.46
Used 3-4 years	3	5	2.19	3.65
Used 5-6 years	2	7	1.46	5.11
Used 7-8 years	3	10	2.19	7.30
Used 9 or more years	4	14	2.92	10.22
Do not use	123	137	89.78	100.00

TABLE XIII

ANALYSIS OF UTILIZATION OF A COMPUTER SERVICE BUREAU

Years of Utilization of a Computer Service Bureau	Frequency	Cum. Freq.	Percent	Cum. Percent
Used 1-2 years	4	4	2.92	2.92
Used 3-4 years	8	12	5.84	8.76
Used 5-6 years	7	19	5.11	13.87
Used 7-8 years	4	23	2.92	16.79
Used 9 or more years	12	35	8.76	25.55
Do not use	102	137	74.45	100.00

TABLE XIV

ANALYSIS OF "OTHER" DATA PROCESSING UTILIZATION

Types of "Other" Data Processing Utilization	Number of Years Used	Frequency
Moldmaker CNC	3-4	1
Firm's Accountant	7-8	1
Grain Market Reporting (AQS)	1-2	1
John Deere D-Parts System	1-2	1
Regional Co-op	5-6	1
Corporate Office	1-2	1

TABLE XV

ANALYSIS OF IN-HOUSE DATA PROCESSING
BY PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Frequency	Cum. Freq.	Percent	Cum. Percent
Retailing	24	24	23.53	23.53
Manufacturing	32	56	31.37	54.90
Wholesaling	14	70	13.73	68.63
Construction	6	76	5.88	74.51
Printing and Publishing	4	80	3.92	78.43
Insurance	3	83	2.94	81.37
Transportation	0	83	-	-
"Other" business	19	102	18.63	100.00

An analysis of the utilization of in-house data processing by the annual gross revenue of the businesses is contained in Table XVI. Twenty-eight of the respondents, or 28.87 percent, of the businesses who utilize in-house data processing had annual gross revenue of $5-$9.99 million. However, a total of 42 respondents, or 43.30 percent, who utilize in-house data processing had annual gross revenue of less than $5 million.

An analysis by primary business purpose of all types of data processing, by number of years utilized, is contained in Table XVII. For each type of business, in-house data processing was the most frequently used type of data processing, and the majority had used it less than six years. An analysis by annual gross revenue of all types of data processing, by number of years utilized, is contained in Table XVIII. For businesses with an annual gross revenue of $1-$1.99 million, in-house data processing and use of a computer service bureau had equal respondents. However, the computer service bureau was used for more years than in-house data processing. In all other gross revenue categories, the use of in-house data processing was more prevalent, and companies with gross revenues of over $5 million have used it for longer periods of times. Both of these tables utilize cell frequencies.

As previously shown in Table IX on page 43, there were 92 respondents which indicated they did not utilize any computerized data processing. These respondents were asked to indicate whether they were considering acquiring in-house data processing capabilties in the near future, and Table XIX contains the results of this analysis. Sixty-three respondents, or 68.48 percent, answered 'No', and only 29 respondents, or 31.52 percent, answered 'Yes'.

TABLE XVI

ANALYSIS OF IN-HOUSE DATA PROCESSING
BY ANNUAL GROSS REVENUE

Annual Gross Revenue	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than $1 Million	4	4	4.12	4.12
$1-$1.99 Million	12	16	12.37	16.49
$2-$2.99 Million	12	28	12.37	28.86
$3-$3.99 Million	8	36	8.25	37.11
$4-$4.99 Million	6	42	6.19	43.30
$5-$9.99 Million	28	70	28.87	72.17
$10-$14.99 Million	18	88	18.55	90.72
$15-$19.99 Million	6	194	6.19	96.91
$20-$24.99 Million	3	97	3.09	100.00
Not Reported	5	102	-	-

TABLE XVII

ANALYSIS BY PRIMARY BUSINESS PURPOSE OF THE TYPES OF DATA PROCESSING UTILIZED

Primary Business Purpose	Types of Data Processing	Number of Years Utilized				
		1-2	3-4	5-6	7-8	9 or more
Retailing	In-House Data Processing	8	8	4	2	2
	Time-sharing	1	1	-	1	-
	Computer Service Bureau	2	5	3	3	4
	Other	1	-	-	-	-
Manufacturing	In-House Data Processing	10	11	7	1	3
	Time-sharing	-	1	-	1	1
	Computer Service Bureau	-	2	2	-	1
	Other	-	1	-	-	-
Wholesaling	In-House Data Processing	6	4	2	1	1
	Time-sharing	-	-	-	-	1
	Computer Service Bureau	-	-	-	1	-
	Other	-	-	-	-	-
Construction	In-House Data Processing	2	2	1	1	-
	Time-sharing	-	-	-	-	1
	Computer Service Bureau	-	-	1	-	-
	Other	-	-	-	-	-
Printing and Publishing	In-House Data Processing	-	2	2	-	-
	Time-sharing	-	-	-	-	-
	Computer Service Bureau	-	-	-	-	-
	Other	-	-	-	-	-
Insurance	In-House Data Processing	1	1	-	-	1
	Time-sharing	-	-	2	-	-
	Computer Service Bureau	-	-	-	-	-
	Other	-	-	-	-	-
Transportation	In-House Data Processing	-	-	-	-	-
	Time-sharing	1	-	-	-	-
	Computer Service Bureau	-	-	1	-	-
	Other	-	-	-	-	-
Other	In-House Data Processing	5	6	3	-	5
	Time-Sharing	-	1	-	1	1
	Computer Service Bureau	2	1	-	-	7
	Other	1	1	1	1	1

TABLE XVIII

ANALYSIS BY ANNUAL GROSS REVENUE OF THE TYPES OF DATA PROCESSING UTILIZED

Annual Gross Revenue	Types of Data Processing	Number of Years Utilized				
		1-2	3-4	5-6	7-8	9 or more
Less than $1 Million	In-House Data Processing	1	1	3	-	-
	Time-sharing	-	1	-	-	-
	Computer Service Bureau	-	1	-	-	-
	Other	-	-	-	1	1
$1-$1.99 Million	In-House Data Processing	8	3	-	-	1
	Time-sharing	1	2	1	-	1
	Computer Service Bureau	2	2	3	-	5
	Other	-	1	-	-	-
$2-$2.99 Million	In-House Data Processing	5	3	2	-	2
	Time-sharing	-	-	-	-	1
	Computer Service Bureau	1	-	-	-	3
	Other	-	1	-	-	-
$3-$3.99 Million	In-House Data Processing	2	2	3	-	1
	Time-sharing	-	-	-	1	-
	Computer Service Bureau	-	1	-	1	-
	Other	1	-	1	-	-
$4-$4.99 Million	In-House Data Processing	2	2	1	-	1
	Time-sharing	-	-	-	-	-
	Computer Service Bureau	-	1	-	1	-
	Other	1	-	1	-	-
$5-$9.99 Million	In-House Data Processing	5	15	3	1	4
	Time-sharing	1	-	-	-	1
	Computer Service Bureau	-	-	2	1	1
	Other	1	-	-	-	-
$10-$14.99 Million	In-House Data Processing	7	6	2	2	1
	Time-sharing	-	-	-	1	1
	Computer Service Bureau	1	2	-	1	1
	Other	-	-	-	-	-
$15-$19.99 Million	In-House Data Processing	1	-	3	1	1
	Time-Sharing	-	-	-	-	-
	Computer Service Bureau	-	-	1	-	-
	Other	-	-	-	-	-
$20-$24.99 Million	In-House Data Processing	-	1	2	-	-
	Time-Sharing	-	-	1	1	-
	Computer Service Bureau	-	1	-	-	-
	Other	-	-	-	-	-

TABLE XIX

ANALYSIS OF CONSIDERATION TO ACQUIRE IN-HOUSE DATA PROCESSING

Consideration to Acquire In-House Data Processing	Frequency	Cum. Freq.	Percent	Cum. Percent
Are considering acquiring data processing	29	29	31.52	31.52
Are not considering acquiring data processing	63	92	68.48	100.00

Table XX contains an analysis by primary business purpose of those businesses who are and are not considering acquiring data processing. Retailing businesses (with 7 responses or 24.14 percent) and manufacturing businesses (with 6 responses or 20.69 percent) were the types of businesses which had the most respondents considering the acquisition of data processing. Of those businesses not considering the acquisition of data processing, 23 responses (or 36.51 percent) came from retailing businesses.

Table XXI contains an analysis by amount of annual gross revenue of those businesses who are and are not considering acquiring data processing. Eight responses, or 27.59 percent, of the businesses considering in-house data processing came from those with less than $1 million in annual gross revenue. However, 29 responses (or 46.77 percent) of the businesses not considering in-house data processing also came from the annual gross revenue category of less than $1 million.

TABLE XX

ANALYSIS BY PRIMARY BUSINESS PURPOSE OF CONSIDERATION TO ACQUIRE IN-HOUSE DATA PROCESSING

Consideration to Acquire In-House Data Processing	Primary Business Purpose	Freq.	Cum. Freq.	Percent	Cum. Percent
Are considering acquiring data processing	Retailing	7	7	24.14	24.14
	Manufacturing	6	13	20.69	44.83
	Wholesaling	3	16	10.34	55.17
	Construction	2	18	6.90	62.07
	Printing and Publishing	1	19	3.45	65.52
	Insurance	1	20	3.45	68.97
	Transportation	1	21	3.45	72.42
	Other	8	29	27.58	100.00
Are not considering acquiring data processing	Retailing	23	23	36.51	36.51
	Manufacturing	7	30	11.11	47.62
	Wholesaling	9	39	14.29	61.91
	Construction	8	47	12.70	74.61
	Printing and Publishing	0	47	-	-
	Insurance	0	47	-	-
	Transportation	2	49	3.17	77.78
	Other	14	63	22.22	100.00

TABLE XXI

ANALYSIS BY ANNUAL GROSS REVENUE OF CONSIDERATION TO ACQUIRE IN-HOUSE DATA PROCESSING

Consideration to Acquire In-House Data Processing	Primary Business Purpose	Freq.	Cum. Freq.	Percent	Cum. Percent
Are considering acquiring data processing	Less than $1 Million	8	8	27.59	27.59
	$1-$1.99 Million	6	14	20.69	48.28
	$2-$2.99 Million	5	19	17.24	65.52
	$3-$3.99 Million	1	20	3.45	68.97
	$4-$4.99 Million	3	23	10.34	79.31
	$5-$9.99 Million	6	29	20.69	100.00
	$10-$14.99 Million	0	29	-	-
	$15-$19.99 MIllion	0	29	-	-
	$20-$24.99 Million	0	29	-	-
Are not considering acquiring data processing	Less than $1 Million	29	29	46.77	46.77
	$1-$1.99 Million	8	37	12.90	59.67
	$2-$2.99 Million	9	46	14.52	74.19
	$3-$3.99 Million	1	47	1.61	75.80
	$4-$4.99 Million	4	51	6.45	82.25
	$5-$9.99 Million	9	60	14.52	96.77
	$10-$14.99 Million	2	62	3.23	100.00
	$15-$19.99 MIllion	0	62	-	-
	$20-$24.99 Million	0	62	-	-
	Not Reported	1	63	-	-

Some of the firms who do utilize computerized data processing but do not have their own in-house computer, expressed their interests in acquiring in-house data processing. Some of their comments were:

"I am interested in a small unit when prices drop and usage becomes more simplified."

"Seriously considering a small in-house computer."

"We are in the process of looking at different systems right now and thus far are leaning toward IBM."

"Very well satisfied, but hope to have in-house in near future."

"We are currently investigating the possibility of having all of our data processing in-house."

"We may consider in the future putting out books on computer."

"We have just contracted for an in-house computer."

"We are presently in the process of purchasing our own in-house computer system."

"We hope to someday acquire our own in-house system."

"We probably will be using our own system within the next five years."

Many of the firms that do not have computerized data processing at the present time wrote comments conerning their interest in acquiring data processing. Some of their comments were:

"Attracted to new wave of mini systems."

"For possible use of accounts receivable, billing, accounts payable, payroll."

"We have been using two NCR machines, a 31 model and a 32 model. Even if we did not want to go to a computer, we would be forced to do so because of the difficulty getting service on these machines. Parts are a problem."

"The most important factor for an in-house computer are the software programs not the basic hardware."

"Before the end of July, our company will have purchased a computer. Our choice at this time are Xerox, IBM, or Honeywell."

"In the future will probably buy a mini-computer (within 2 years)."

"To use with general ledger accounting, accounts receivable/ payable, payroll, sales forecasting, word processing, and income tax preparation."

"Considering in-house, however, may go to service bureau or merely electronic P.O.S. at this time."

"Possible purchase this fall to be used in wide range of functions--accounts receivable, accounts payable, payroll, inventory, routing, and other accounting functions. Approximate cost $15,000."

"Commodore V20 a possibility."

"Will purchase small computer with printer to handle payroll, accounts receivable, sales, cost records, inventory, general ledger, etc. within next two-three years."

"Currently studying in-house computer. Start up with: accounts receivable, payroll. Equipment to be tied in with word processor capabilities."

"We are presently planning to put subscription, bookkeeping, and video terminal typesetting into the system."

"We have plans to install a computer. Possibly within the next 12 months."

"We are just a ranch corporation and our computer needs are strictly for our operation (bookkeeping, cash flow, cattle performance records, info. storage, etc.)"

"Priority: 1. Payroll 2. A/P 3. A/R 4. Inventory"

"If economy improves and work is there, we would consider a computer in the future."

"We plan on investing in a small business computer/word processor in approximately two years."

"In the process of currently inquiring into different small business computers and their programs available to best fit our particular needs."

Some of the firms also included their comments concerning their decision not to acquire data processing. Some of their comments were:

"We do not see any possibility of getting a computer--now or in the future."

"Not financially feasible."

"At the present time we are not planning on purchasing a computer."

"We feel that we are too small for a computer."

"No plans for computer utilization now or in the future."

"The use of a computer is not efficient to our needs. We have tried computers but found them more time consuming."

"None at this time."

"90% of small firms using computers get into serious financial difficulty using them, paying for them, or relying on their data. When an inventory control system for multiple locations gets cheap enough, I will put one in."

"Not interested."

"We have a lot of headaches with our suppliers that use a computer. They make so many mistakes and hard to get them straightened out."

"Don't know much about computers. I would not want to spend much time on input. I know they have many possibilities."

"We currently have some programs wherein improved efficiency will be required through computerization at some point in the future."

"We have a small number of accounts receivable for our annual sales volume, so are presently happy with our manual system."

"We have yet to find any company with suitable software at a suitable price."

"Too hard to get qualified personnel to use one for our small business."

"We will never take the time to do the required programming."

"If farming does not get better we will not be in business to buy anything."

Analysis of In-House Data Processing--Hardware, Software, and Data Processing Employees

Section II of the questionnaire was designed to obtain information about the system hardware in use by those firms that have in-house data processing capabilities. It also included questions on the purhcase price and/or monthly lease payments of the computer system and the types of data processing employees. See Appendix B for the questionnaire.

Table XXII contains an analysis of the computer systems (by the name of the manufacturer) utilized for in-house data processing by small businesses. Forty respondents, or 34.78 percent, reported the use of IBM computer systems. Sixteen respondents (or 13.91 percent) used Burroughs computer systems, and 12 respondents (or 10.43 percent) used Radio Shack computer systems. The other 47 computer systems were made by 20 other manufacturers. Some businesses reported the use of more than one computer system.

The respondents were also asked to indicate the number of bytes of primary storage their computer had. Twenty of the respondents did not indicate the amount of primary storage their computer system had, which left 95 computer systems for this analysis as compared to the 115 computer systems reported in Table XXII. An analysis of the computer systems in use by their amount of primary storage is contained in Table XXIII. Twenty-seven of the computer systems (or 28.42 percent) had 33K to 64K bytes of primary storage, and 21 computer systems (or 22.11 percent) had 65K to 128K bytes of primary storage. Seventy-four of the computer systems, or 77.90 percent, had less than 256K bytes of primary storage. Fifty-eight of the computers, or 61.06 percent, had between 33K and 256K bytes of primary storage. Forty-three computers (or 45.26

TABLE XXII

ANALYSIS OF COMPUTER SYSTEMS UTILIZED

Computer Manufacturer	Frequency	Cum. Freq.	Percent	Cum. Percent
Apple	4	4	3.47	3.47
Burroughs	16	20	13.91	17.38
Commodore-Pet	1	21	0.87	18.25
Digital Equipment	8	29	6.96	25.21
IBM	40	69	34.78	60.99
NCR	8	77	6.96	66.95
Radio Shack	12	89	10.43	77.38
Wang	2	91	1.74	79.12
OTHER TYPES:				
Cado	1	92	0.87	79.99
Data General	5	97	4.35	84.34
Display Data	1	98	0.87	85.21
ICL	1	99	0.87	86.08
Lexitron	1	100	0.87	86.95
Microdata	2	102	1.74	88.19
Mylee	1	103	0.87	89.56
North Star	1	104	0.87	90.43
Ohio Scientific	2	106	1.74	92.17
Olivetti	1	107	0.87	93.04
Plessey	1	108	0.87	93.91
Quantel	2	110	1.74	95.65
Singer	2	112	1.74	97.39

TABLE XXII (Continued)

Computer Manufacturer	Frequency	Cum. Freq.	Percent	Cum. Percent
Texas Instruments	2	114	1.74	99.13
Ultimate	1	115	0.87	100.00

TABLE XXIII

ANALYSIS OF COMPUTER SYSTEMS BY THE NUMBER OF BYTES OF PRIMARY STORAGE

Number of Bytes of Primary Storage	Frequency	Cum. Freq.	Percent	Cum. Percent
16K or less	11	11	11.58	11.58
17K - 32K	5	16	5.26	16.84
33K - 64K	27	43	28.42	45.26
65K - 128K	21	64	22.11	67.37
129K -256K	10	74	10.53	77.90
257K - .49MB	5	79	5.26	83.16
.5MB - .99MB	7	86	7.37	90.53
1MB - 1.99 MB	5	91	5.26	95.79
Over 2MB	4	95	4.21	100.00
Not Reported	20	115	-	-

percent) had less than 64K bytes of primary storage, and 52 computers (or 54.74 percent) had more than 64K bytes of primary storage. Table XXIV contains an analysis of the computer manufacturers by the number of bytes of primary storage using cell frequencies. The IBM computers were the only computers represented in every range of primary storage size. However, 29 of the IBM computers had less than 256K bytes of primary storage. Radio Shack had 9 computers in the range of 33K to 256K bytes, and Burroughs had 7 computers reported with less than 128K bytes of primary storage.

The large majority of companies reported the purchase of their computer system, rather than making monthly lease payments. Eighty-eight respondents indicated they had purchased their computer system, and only 15 respondents indicated monthly lease payments, four of which were by companies that also indicated they had purchased a portion of their computer system. Twenty-eight respondents (or 31.81 percent) indicated purchase prices of $20,000 to $49,999, and 22 respondents (or 25 percent) indicated purchase prices of $50,000 to $99,999. Sixty-five respondents, or 73.86 percent, indicated purchase prices in the $20,000 to $100,000 range. Of the respondents which indicated monthly lease payments, 60 percent of the payments were less than $3,000 monthly. Table XXV contains an analysis of the purhcase prices, and Table XXVI an analysis of the monthly lease payments.

Table XXVII contains an analysis of the types of peripheral equipment currently in use. Terminals, printers, and disk drives are the most commonly used types of peripheral equipment. Card readers were the type of peripheral equipment used the least, with only 7 respondents indicating their use.

TABLE XXIV

ANALYSIS OF THE COMPUTER MANUFACTURER'S AND THE NUMBER OF BYTES OF PRIMARY STORAGE

Computer Manufacturer	Number of Bytes of Primary Storage									
	Not Reported	16K or less	17K-32K	33K-64K	65K-128K	129K-256K	257K-.49MB	.5MB-.99MB	1MB - 1.99MB	Over 2MB
Apple		-	-	2	2	-	-	-	-	-
Burroughs	7	2	1	3	1	-	1	1	-	-
Commodore-Pet		1	-	-	-	-	-	-	-	-
Digital Equipment		-	1	-	1	1	1	-	4	-
IBM	6	4	2	9	10	4	1	1	1	2
NCR		2	-	3	2	-	-	1	-	-
Radio Shack	2	-	-	6	1	2	-	1	-	-
Wang		-	-	1	1	-	-	-	-	-
OTHER TYPES:										
Cado	1	-	-	-	-	-	-	-	-	-
Data General		-	-	1	-	1	-	1	-	2
Display Data		-	-	-	1	-	-	-	-	-
ICL	1	-	-	-	-	-	-	-	-	-
Lexitron		-	-	-	1	-	-	-	-	-
Microdata		1	-	-	1	-	-	-	-	-
Mylee	1	-	-	-	-	-	-	-	-	-
North Star		-	-	1	-	-	-	-	-	-
Ohio Scientific		-	-	-	-	-	-	2	-	-
Olivetti		1	-	-	-	-	-	-	-	-
Plessey		-	-	-	-	1	-	-	-	-

TABLE XXIV (Continued)

Computer Manufacturer	Number of Bytes of Primary Storage									
	Not Reported	16K or less	17K-32K	33K-64K	65K-128K	129K-256K	257K-.49MB	.5MB-.99MB	1MB - 1.99MB	Over 2MB
Quantel	1	-	-	-	-	1	-	-	-	-
Singer	1	-	1	-	-	-	-	-	-	-
Texas Instruments		-	-	-	-	-	2	-	-	-
Ultimate		-	-	1	-	-	-	-	-	-

TABLE XXV

ANALYSIS OF PURCHASE PRICES

Purchase Price	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than $5,000	5	5	5.68	5.68
$5,000 - $9,999	12	17	13.64	19.32
$10,000 - $19,999	6	23	6.82	26.14
$20,000 - $49,999	28	51	31.81	57.95
$50,000 - $99,999	22	73	25.00	82.95
More than $100,000	15	88	17.05	100.00
Not Reported	3	91	-	-

TABLE XXVI

ANALYSIS OF MONTHLY LEASE PAYMENTS

Monthly Lease Payments	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than $500 per month	2	2	13.33	13.33
$500-$999 per month	3	5	20.00	33.33
$1,000-$1,499 per month	2	7	13.33	46.66
$1,500-$2,999 per month	2	9	13.33	59.99
$3,000-$4,999 per month	4	13	26.68	86.67
More than $5,000 per month	2	15	13.33	100.00
Not Reported	3	18	-	-

TABLE XXVII

ANALYSIS OF THE TYPES OF PERIPHERAL EQUIPMENT

Type of Peripheral Equipment	Number of Units				
	1-3	4-6	7-9	10-12	More than 12
Intelligent terminals	23	11	4	1	3
Dumb terminals	14	8	2	1	3
Printers	74	5	2	-	-
Card readers	6	1	-	-	-
Magnetic tape drives	13	1	-	-	-
Magnetic disk drives	27	7	1	-	-
Floppy disk drives	38	3	2	-	3
OTHER TYPES:					
IBM 5265 cash registers	-	1	-	-	-
Tape cassette	2	-	-	-	-
Data collection terminals--badge readers	1	-	-	-	-
Data collection controller	1	-	-	-	-
Hard disk	1	-	-	-	-
Modem line drive	1	-	-	-	-

*Three respondents reported no peripheral equipment, and 5 respondents left this question blank.

The types of data processing employees currently employed by small businesses is reported in Table XXVIII. The largest number of data processing employees are operators, with 65 total responses. Data entry clerks had the second most responses with 49, and programmers were third highest with 33 responses.

TABLE XXVIII

ANALYSIS OF THE TYPES OF DATA PROCESSING EMPLOYEES

Type of Data Processing Employees	Number of Employees				
	1-5	6-10	11-15	16-20	More than 20
Programmers	33	-	1	-	-
Systems analysts	7	1	-	-	-
Operators	64	1	-	-	-
Data entry clerks	42	5	2	-	-
DP Managers	24	-	-	-	-
OTHER TYPES:					
Parts Counter Salesmen	1	-	-	-	-
Controller	1	-	-	-	-
Controller-Programmer	1	-	-	-	-
Contract Programming	1	-	-	-	-

*Three respondents reported no data processing employees, and 5 respondents left this question blank.

The respondents were also asked to identify the types of data processing employees they expect to hire within the next five years. Operators were again identified as the type of employee to be most in demand with 32 responses. Data entry clerks and programmers were the next most in demand with 21 and 20 responses, respectively. Table XXIX contains an analysis of the types and number of data processing employees needed in the next five years.

TABLE XXIX

ANALYSIS OF THE TYPES OF DATA PROCESSING EMPLOYEES TO BE EMPLOYED IN THE NEXT FIVE YEARS IN ADDITION TO CURRENT EMPLOYEES

Type of Future Data Processing Employee	Number of Employees				
	1-5	6-10	11-15	16-20	More than 20
Programmers	20	-	-	-	-
Systems analysts	6	-	-	-	-
Operators	31	1	-	-	-
Data entry clerks	19	2	-	-	-
DP Managers	6	-	-	-	-

*48 respondents reported no additional data processing employees to be employed in the future, and 3 respondents left this question blank.

Many of the firms who have in-house data processing capabilities wrote comments concerning the use of data processing by their firm. Some of their comments were:

"The system functions are forecasted to increase dramatically over the next five years. We will be upgrading next year."

"An invaluable management information tool."

"We are attempting to utilize vendor software with no modifications and elimination of need for in-house programmer and associated headaches."

"Will be expanding to a more larger system within next 24 months."

"We presently have 12 operating CATV systems of which 4 have in-house TRS 80's (with specialized program software) processing A/R and cash receipts. All general accounting functions are done with a service bureau."

"We would like to do much more with a computer than presently. Software is limiting factor--we are using a micro but would use larger if software were available at reasonable cost."

"Presently using 2 NCR 399's using hard copy records with computer capability--by 1985 will upgrade system."

"We plan to have a back-up unit soon."

"Our present IBM S/34 and 5 tubes is adequate for the forseeable future."

"Main trend in MIS has been away from packages toward in-house systems."

"Considering micro-computers in each of our 12 locations."

"Necessary."

"We are presently considering software designed specifically for the printing industry and a sales-inventory program. We will have to add hardware if we decide to add these programs."

"Have anticipated buying a large in-house system, but have delayed due to economy. A larger system would enable us to tie in with General Motors on ordering trucks and processing claims and many other items."

"We expect to be 95% computerized for office information systems by 1984."

"We currently have installed the basic applications to administrate our business. Future plans are to enhance these applications to install additional informational packages, i.e., budgeting, modeling."

"Computers are a necessity for all small 15-100 man firms. The prices of these computers are now within a small firm's budget."

"We run all customized software. We operate 2 corporations through the system, as well as several functions for other concerns. We expect to begin (this summer) to tidy this up into packages with the expectation of selling these to others in our industry (lumber)."

Analysis of Business Applications and Software

Section III of the questionnaire was designed to obtain information about the types of business applications computers are used for in small businesses. The researcher was interested in those applications which were put on the computer initially, those applications currently in use, and all future applications. However, some of the respondents did not respond to all three categories. This section was also designed to identify the source of the business application programs, and to identify the primary and secondary programming languages used on the respondent's computer systems. See Appendix B for the complete questions.

Those applications which were initially put on the respondent's computer systems are tabulated in Table XXX. The initial application used the most was accounts receivable/billing with 53 respondents, or 19.70 percent. Payroll and general ledger accounting were the next two most-used initial applications, with 44 and 43 respondents (or 16.36 and 16.00 percent) respectively. The only other two commonly used initial applications were accounts payable/writing checks and inventory control, with 31 and 30 respondents (or 11.52 and 11.15 percent) respectively.

TABLE XXX

ANALYSIS OF INITIAL BUSINESS APPLICATIONS

Type of Application	Frequency	Cum. Freq.	Percent	Cum. Percent
General ledger accounting	43	43	16.00	16.00
Accounts receivable/ billing	53	96	19.70	35.70
Accounts payable/ writing checks	31	127	11.52	47.22
Payroll	44	171	16.36	63.58
Order processing	23	194	8.55	72.13
Purchasing	11	205	4.09	76.22
Inventory control	30	235	11.15	87.37
Sales forecasting	0	235	-	-
Budgeting	7	242	2.60	89.97
Income tax preparation	1	243	0.37	90.34
Word processing	6	249	2.23	92.57
"Other" types	20	269	7.43	100.00
Not reported	21	-	-	-

Table XXXI contains a comprehensive listing of the "other" types of initial applications which were indicated by the respondents.

Table XXXII contains those applications which are currently in use by small businesses. Again, accounts receivable/billing had the most respondents with 75, or 14.82 percent; general ledger accounting had 65 respondents, or 12.85 percent; and payroll had 64 respondents, or 12.65 percent. The next two most used applications, accounts payable/writing checks and inventory control, both had 59 respondents, or 11.66 percent. Order processing had 43 respondents, or 8.50 percent. A complete list of the "other" types of current applications is contained in Table XXXIII.

Respondents were also asked to indicate those applications they intend to use in the future. Table XXXIV contains an analysis of future business applications. Again, general ledger accounting and accounts receivable/billing both had 67 respondents, or 12.62 percent. The next two applications with the most responses, 62 and 61 (or 11.68 and 11.49 percent) respectively, were accounts payable/writing checks and payroll. Inventory control had 58 respondents, or 10.92 percent. A complete list of "other" responses of future business applications is in Table XXXV.

Table XXXVI contains an analysis by primary business purpose of initial business applications. Of the eleven types of initial business applications listed in Table XXXVI, manufacturing businesses indicated the most usage of each type. Table XXXVII contains an analysis by primary business purpose of current business applications. Again, manufacturing businesses indicated the most usage of each type of current business application. Table XXXVIII contains an analysis by primary business purpose of future business applications. Manufacturing

TABLE XXXI

"OTHER" TYPES OF INITIAL BUSINESS APPLICATIONS

Type of Application	Frequency
Labor reporting--shop	1
Labor distribution--accounting	1
Route accounting	1
Job costing	3
Sales reporting	1
Sales audit	1
Sales analysis	1
Delivery cost	1
Production cost	1
Commodity trading programs	1
Ginning	1
Crop rotation	1
Monthly reports	1
Cylinder control	1
Fixed assets	1
Bill of material	1
Routing	1
Insurance Renewal	1

TABLE XXXII

ANALYSIS OF CURRENT BUSINESS APPLICATIONS

Type of Application	Frequency	Cum. Freq.	Percent	Cum. Percent
General ledger accounting	65	65	12.85	12.85
Accounts receivable/ billing	75	140	14.82	27.67
Accounts payable/ writing checks	59	199	11.66	39.33
Payroll	64	263	12.65	51.98
Order processing	43	306	8.50	60.48
Purchasing	31	337	6.13	66.61
Inventory control	59	396	11.66	78.27
Sales forecasting	26	422	5.14	83.41
Budgeting	24	446	4.74	88.15
Income tax preparation	3	449	0.59	88.74
Word processing	17	466	3.36	92.10
"Other" types	40	506	7.90	100.00
Not reported	5	-	-	-

TABLE XXXIII

"OTHER" TYPES OF CURRENT BUSINESS APPLICATIONS

Type of Application	Frequency
Labor reporting--shop	1
Labor distribution--accounting	2
Route accounting	1
Job costing	3
Sales promotion	1
Sales reporting	1
Sales audit	1
Sales analysis	2
Delivery cost	1
Production control and costing	2
Commodity trading programs	1
Ginning	1
Crop rotation	1
Monthly reports	1
Cylinder control	1
Fixed assets	1
Bill of material	1
Routing	1
Insurance Renewal	1
Numerous support functions	1
Production planning	1
Commissions	1
Utility engineering applications	1

TABLE XXXIII (Continued)

Type of Application	Frequency
Construction cost accounting	1
Depreciation	1
Product data management	2
Other inventory	1
Direct mailing (to non-customers)	1
Cost estimating	1
Work in process	1
Grain hedging	1
Grain shipments	1
Grain contracting	1
Shop floor control	1

TABLE XXXIV

ANALYSIS OF FUTURE BUSINESS APPLICATIONS

Type of Application	Frequency	Cum. Freq.	Percent	Cum. Percent
General ledger accounting	67	67	12.62	12.62
Accounts receivable/ billing	67	134	12.62	25.24
Accounts payable/ writing checks	62	196	11.68	36.92
Payroll	61	257	11.49	48.41
Order processing	41	298	7.72	56.13
Purchasing	38	336	7.15	63.28
Inventory control	58	394	10.92	74.20
Sales forecasting	34	428	6.40	80.60
Budgeting	36	464	6.78	87.38
Income tax preparation	13	477	2.45	89.83
Word processing	30	507	5.65	95.48
"Other" types	24	531	4.52	100.00
Not reported	25	-	-	-

TABLE XXXV

"OTHER" TYPES OF FUTURE BUSINESS APPLICATIONS

Type of Application	Frequency
Route accounting	1
Cost accounting	5
Sales reporting	1
Sales audit	1
Engineering	1
Quotations	1
Production standards	1
Cost estimating	3
Ginning	1
Crop rotation	1
Monthly reports	1
Cylinder control	1
Point of sale invoicing	1
Transnet ordering	1
Utility engineering applications	1
Construction cost accounting	1
Material requirements planning	1
Scheduling	1

TABLE XXXVI

ANALYSIS BY PRIMARY BUSINESS PURPOSE OF
INITIAL BUSINESS APPLICATIONS

Type of Business Application	Primary Business Purpose	Frequency
General ledger accounting	Retailing	12
	Manufacturing	13
	Wholesaling	4
	All 'other' types	14
Accounts receivable/billing	Retailing	11
	Manufacturing	17
	Wholesaling	10
	All 'other' types	15
Accounts payable/writing checks	Retailing	8
	Manufacturing	10
	Wholesaling	1
	All 'other' types	12
Payroll	Retailing	8
	Manufacturing	20
	Wholesaling	3
	All 'other' types	13
Order processing	Retailing	5
	Manufacturing	10
	Wholesaling	6
	All 'other' types	2
Purchasing	Retailing	1
	Manufacturing	3
	Wholesaling	4
	All 'other' types	3
Inventory Control	Retailing	5
	Manufacturing	12
	Wholesaling	6
	All 'other' types	7

TABLE XXXVI (Continued)

Type of Business Application	Primary Business Purpose	Frequency
Sales forecasting	Retailing	2
	Manufacturing	2
	Wholesaling	2
	All 'other' types	2
Budgeting	Retailing	1
	Manufacturing	2
	Wholesaling	0
	All 'other' types	4
Income tax preparation	Retailing	0
	Manufacturing	0
	Wholesaling	0
	All 'other' types	1
Word processing	Retailing	1
	Manufacturing	0
	Wholesaling	2
	All 'other' types	3

TABLE XXXVII

ANALYSIS BY PRIMARY BUSINESS PURPOSE OF
CURRENT BUSINESS APPLICATIONS

Type of Business Application	Primary Business Purpose	Frequency
General ledger accounting	Retailing	16
	Manufacturing	19
	Wholesaling	9
	All 'other' types	21
Accounts receivable/billing	Retailing	12
	Manufacturing	26
	Wholesaling	13
	All 'other' types	24
Accounts payable/writing checks	Retailing	14
	Manufacturing	18
	Wholesaling	10
	All 'other' types	17
Payroll	Retailing	14
	Manufacturing	25
	Wholesaling	7
	All 'other' types	18
Order processing	Retailing	8
	Manufacturing	18
	Wholesaling	13
	All 'other' types	4
Purchasing	Retailing	4
	Manufacturing	11
	Wholesaling	10
	All 'other' types	6
Inventory Control	Retailing	12
	Manufacturing	22
	Wholesaling	13
	All 'other' types	12

TABLE XXXVII (Continued)

Type of Business Application	Primary Business Purpose	Frequency
Sales forecasting	Retailing	7
	Manufacturing	9
	Wholesaling	6
	All 'other' types	4
Budgeting	Retailing	4
	Manufacturing	8
	Wholesaling	2
	All 'other' types	10
Income tax preparation	Retailing	1
	Manufacturing	2
	Wholesaling	0
	All 'other' types	0
Word processing	Retailing	3
	Manufacturing	5
	Wholesaling	3
	All 'other' types	6

TABLE XXXVIII

ANALYSIS BY PRIMARY BUSINESS PURPOSE OF
FUTURE BUSINESS APPLICATIONS

Type of Business Application	Primary Business Purpose	Frequency
General ledger accounting	Retailing	13
	Manufacturing	20
	Wholesaling	10
	All 'other' types	24
Accounts receivable/billing	Retailing	10
	Manufacturing	24
	Wholesaling	10
	All 'other' types	23
Accounts payable/writing checks	Retailing	12
	Manufacturing	21
	Wholesaling	10
	All 'other' types	19
Payroll	Retailing	10
	Manufacturing	23
	Wholesaling	6
	All 'other' types	22
Order processing	Retailing	7
	Manufacturing	18
	Wholesaling	10
	All 'other' types	6
Purchasing	Retailing	6
	Manufacturing	14
	Wholesaling	9
	All 'other' types	9
Inventory Control	Retailing	10
	Manufacturing	20
	Wholesaling	11
	All 'other' types	17

TABLE XXXVIII (Continued)

Type of Business Application	Primary Business Purpose	Frequency
Sales forecasting	Retailing	6
	Manufacturing	14
	Wholesaling	6
	All 'other' types	8
Budgeting	Retailing	5
	Manufacturing	12
	Wholesaling	4
	All 'other' types	15
Income tax preparation	Retailing	3
	Manufacturing	3
	Wholesaling	3
	All 'other' types	4
Word processing	Retailing	3
	Manufacturing	11
	Wholesaling	6
	All 'other' types	10

businesses and "other" businesses had the most usage of each type of future business applications.

Table XXXIX contains an analysis by annual gross revenue of initial business applications. Businesses with annual gross revenues between $3 and $9.99 million had the most utilization of each of the eleven types of initial business applications. Table XL contains an analysis by annual gross revenue of current business applications. In all but three of the current business applications, businesses with annual gross revenues between $3 and $9.99 million had the most utilization. For budgeting and word processing, businesses with less than $3 million in annual gross revenue had the most usage. Table XLI contains an analysis by annual gross revenue of future business applications, and each of the three ranges of annual gross revenue had approximately the same usage of each type of business application.

Respondents were also asked to indicate the source of their business application programs, and this analysis is contained in Table XLII. Many respondents indicated more than one source for their programs. Fifty respondents, or 36.23 percent, indicated that their programs were developed by contract programming consultants. Thirty-six respondents, or 26.09 percent, indicated their programs were purchased with the hardware, and programs developed by in-house programming personnel had 32 respondents, or 23.19 percent.

Table XLIII contains an analysis of the primary programming languages used on the in-house computer systems. BASIC was the most commonly used language with 42 responses, or 45.65 percent. RPG had 23 responses, or 25 percent, and COBOL had 18 responses, or 19.57 percent. These three primary languages accounted for a total of 90.22 percent.

TABLE XXXIX

ANALYSIS OF INITIAL BUSINESS APPLICATIONS
BY ANNUAL GROSS REVENUE

Type of Business Application	Annual Gross Revenue	Frequency
General ledger accounting	Less than $3 Million	14
	$3 - $9.99 Million	17
	$10 - $24.99 Million	12
Accounts receivable/billing	Less than $3 Million	13
	$3 - $9.99 Million	26
	$10 - $24.99 Million	14
Accounts payable/writing checks	Less than $3 Million	9
	$3 - $9.99 Million	14
	$10 - $24.99 Million	8
Payroll	Less than $3 Million	12
	$3 - $9.99 Million	22
	$10 - $24.99 Million	10
Order processing	Less than $3 Million	4
	$3 - $9.99 Million	11
	$10 - $24.99 Million	8
Purchasing	Less than $3 Million	1
	$3 - $9.99 Million	6
	$10 - $24.99 Million	4
Inventory Control	Less than $3 Million	4
	$3 - $9.99 Million	16
	$10 - $24.99 Million	10
Sales forecasting	Less than $3 Million	1
	$3 - $9.99 Million	5
	$10 - $24.99 Million	2
Budgeting	Less than $3 Million	3
	$3 - $9.99 Million	4
	$10 - $24.99 Million	0

TABLE XXXIX (Continued)

Type of Business Application	Annual Gross Revenue	Frequency
Income tax preparation	Less than $3 Million	1
	$3 - $9.99 Million	0
	$10 - $24.99 Million	0
Word processing	Less than $3 Million	3
	$3 - $9.99 Million	2
	$10 - $24.99 Million	1

TABLE XL

ANALYSIS OF CURRENT BUSINESS APPLICATIONS
BY ANNUAL GROSS REVENUE

Type of Business Application	Annual Gross Revenue	Frequency
General ledger accounting	Less than $3 Million	22
	$3 - $9.99 Million	27
	$10 - $24.99 Million	16
Accounts receivable/billing	Less than $3 Million	22
	$3 - $9.99 Million	35
	$10 - $24.99 Million	18
Accounts payable/writing checks	Less than $3 Million	16
	$3 - $9.99 Million	26
	$10 - $24.99 Million	17
Payroll	Less than $3 Million	20
	$3 - $9.99 Million	30
	$10 - $24.99 Million	14
Order processing	Less than $3 Million	7
	$3 - $9.99 Million	20
	$10 - $24.99 Million	16
Purchasing	Less than $3 Million	6
	$3 - $9.99 Million	12
	$10 - $24.99 Million	13
Inventory Control	Less than $3 Million	11
	$3 - $9.99 Million	26
	$10 - $24.99 Million	22
Sales forecasting	Less than $3 Million	5
	$3 - $9.99 Million	13
	$10 - $24.99 Million	8
Budgeting	Less than $3 Million	12
	$3 - $9.99 Million	8
	$10 - $24.99 Million	4

TABLE XL (Continued)

Type of Business Application	Annual Gross Revenue	Frequency
Income tax preparation	Less than $3 Million	2
	$3 - $9.99 Million	1
	$10 - $24.99 Million	0
Word processing	Less than $3 Million	7
	$3 - $9.99 Million	5
	$10 - $24.99 Million	5

TABLE XLI

ANALYSIS OF FUTURE BUSINESS APPLICATIONS
BY ANNUAL GROSS REVENUE

Type of Business Application	Annual Gross Revenue	Frequency
General ledger accounting	Less than $3 Million	22
	$3 - $9.99 Million	22
	$10 - $24.99 Million	23
Accounts receivable/billing	Less than $3 Million	20
	$3 - $9.99 Million	26
	$10 - $24.99 Million	21
Accounts payable/writing checks	Less than $3 Million	18
	$3 - $9.99 Million	22
	$10 - $24.99 Million	22
Payroll	Less than $3 Million	20
	$3 - $9.99 Million	24
	$10 - $24.99 Million	17
Order processing	Less than $3 Million	7
	$3 - $9.99 Million	18
	$10 - $24.99 Million	16
Purchasing	Less than $3 Million	7
	$3 - $9.99 Million	15
	$10 - $24.99 Million	16
Inventory Control	Less than $3 Million	15
	$3 - $9.99 Million	22
	$10 - $24.99 Million	21
Sales forecasting	Less than $3 Million	7
	$3 - $9.99 Million	16
	$10 - $24.99 Million	11
Budgeting	Less than $3 Million	12
	$3 - $9.99 Million	12
	$10 - $24.99 Million	12

TABLE XLI (Continued)

Type of Business Application	Annual Gross Revenue	Frequency
Income tax preparation	Less than $3 Million	5
	$3 - $9.99 Million	2
	$10 - $24.99 Million	6
Word processing	Less than $3 Million	10
	$3 - $9.99 Million	10
	$10 - $24.99 Million	10

TABLE XLII

ANALYSIS OF SOURCE OF BUSINESS APPLICATION PROGRAMS

Source of Programs	Freq.	Cum. Freq.	Percent	Cum. Percent
Programs purchased with hardware	36	36	26.09	26.09
Programs developed by in-house programming personnel	32	68	23.19	49.28
Programs developed by contract programming consultants	50	118	36.23	85.51
Proprietary software packages developed by software houses	19	137	13.77	99.28
Other--Ford Motor Co. DCS Dept.	1	138	0.72	100.00
Not reported	1	-	-	-

TABLE XLIII

ANALYSIS OF PRIMARY PROGRAMMING LANGUAGES USED

Name of Language	Frequency	Cum. Freq.	Percent	Cum. Percent
BASIC	42	42	45.65	45.65
COBOL	18	60	19.57	65.22
FORTRAN	0	60	-	-
PASCAL	0	60	-	-
PL/1	0	60	-	-
RPG	23	83	25.00	90.22
OTHER TYPES:				
Assembler	1	84	1.09	91.31
DIBOL	2	86	2.17	93.48
RPG II	5	91	5.43	98.91
Wang MVP BASIC II	1	92	1.09	100.00
Not reported	10	-	-	-

Respondents were also asked to identify any secondary programming languages used on their computer system, and this analysis is contained in Table XLIV. Again, BASIC had the most responses with 10, and COBOL and FORTRAN both had 7 respondents.

TABLE XLIV

ANALYSIS OF SECONDARY PROGRAMMING LANGUAGES USED

Name of Language	Frequency
BASIC	10
COBOL	7
FORTRAN	7
PASCAL	1
PL/1	0
RPG	2
OTHER TYPES:	6
Assembler	2
NDL	1
RPL	1
None	70
Not reported	10

Comparison of Selected Items in Questionnaire

For various items of the questionnaire, two-way tables were utilized and the chi-square test for significance was computed. The .10 level of significance has been selected for this study. The relationships which were analyzed are presented in statistical tables in Appendix D. The following information for each cell in the two-way table has been given: oberserved frequency, expected frequency, percent, row percent, and column percent. Row and column totals and percentages are also given as well as the results of the chi-square test, the degrees of freedom, and the significance level.

Seventy-six percent of the manufacturing businesses have data processing. The other types of businesses did not have a significant trend toward the utilization of data processing. A chi-square significance level of .07 indicated there was a significant difference at the .10 level between types of businesses and the utilization of data processing. Table XLV in Appendix D gives a complete summary of the results.

For businesses with $3-$9.99 million in annual gross revenue, 68 percent have data processing; and for businesses with $10-$24.99 million in annual gross revenue, 94 percent have data processing. The majority of businesses with less than $3 million in annual gross revenue (56 percent) do not have data processing. A chi-square significance level of .0001 indicated there was a significant difference at the .10 level between annual gross revenue and the utilization of data processing. Table XLVI in Appendix D gives a complete summary of the results.

Of all businesses currently using computerized accounts receivable/billing, only the retailing businesses did not show a significant trend.

Eighty-one percent of the manufacturing businesses, 93 percent of the wholesaling businesses, and 75 percent of the other businesses utilize computerized accounts receivable/billing. A chi-square significance level of .0146 indicated there was a significant difference at the .10 level. The complete results are given in Table XLVII in Appendix D.

Only manufacturing businesses (56 percent) and wholesaling businesses (93 percent) had a significant trend toward the use of computerized order processing. A chi-square significance level of .0001 indicated a significant difference at the .10 level, and the complete results are given in Table XLVIII in Appendix D. This same trend was also true for computerized purchasing. Thirty-four percent of the manufacturing businesses and 71 percent of the wholesaling businesses utilized computerized purchasing. A chi-square significance level of .0014 indicated a significant difference at the .10 level, and the complete results are given in Table XLIX in Appendix D. Finally, this same trend was also apparent for computerized inventory control. Sixty-eight percent of the manufacturing businesses, and 93 percent of the wholesaling businesses utilized computerized inventory control. A chi-square significance level of .0022 indicated a significant difference at the .10 level, and the complete results are given in Table L in Appendix D. Considering the types of records and information with which manufacturing and wholesaling businesses use, it was not too surprising that these businesses would have computerized order processing, purchasing, and inventory control.

The same three computerized business applications--order processing, purchasing, and inventory control--were also significant for the two-way tables by annual gross revenue. Forty-eight percent of the

businesses with $3-$9.99 million annual gross revenue and 59 percent of the businesses with $10-$24.99 million annual gross revenue used computerized order processing. A chi-square significance level of .0079 indicated a significant difference at the .10 level: the results are summarized in Table LI in Appendix D. However, the trend was a little different for the purchasing application. Eighty-two percent of the businesses with less than $3 million in annual gross revenue, and 71 percent of the businesses with $3-$9.99 million in annual gross revenue do not use computerized purchasing. A chi-square significance level of .0405 indicated a significant difference at the .10 level of significance, and the results are summarized in Table LII in Appendix D. Sixty-two percent of the businesses with $3-$9.99 million in annual gross revenue and 81 percent of the businesses with $10-$24.99 million use computerized inventory control. A chi-square significance level of .0007 indicated a significant difference at the .10 level, and the results are summarized in Table LIII in Appendix D. It would be logical that businesses with higher revenue levels would indicate their use of computerized order processing and inventory control.

Summary

This chapter has presented an analysis of the responses received on the questionnaire. The responses were tabulated and reported using frequencies, cumulative frequencies, percentages, and cumulative percentages. Two-way tables and the chi-square test for significance were also utilized for selected items. The results were summarized and presented through the discussion and tables within this chapter and in Appendix D. The conclusions and recommendations are presented in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Computers will continue to play a greater role in the lives of all businesses as technology continues to move forward at a rapid pace. Much of the technology we are using currently was not predicted to be on the marketplace before 1985, and technology that was predicted to arrive by the year 2000 will probably be in use before 1985 also. It is said that if the car industry had grown as fast technologically as the computer industry in the last 30 years, a Rolls Royce would cost only $2.50 and get two million miles per gallon of gas. If airplanes had progressed as fast technolgocially as the computer industry, we would be able to fly across the United States in two seconds. The impact of this technology has been felt in all aspects of society. However, the business world has probably experienced some of the greatest effects of the technological revolution. It is very important that researchers look at the effect the computer industry has had upon the business world in order to update, change, and expand business education programs to meet the needs of its students. Graduates of business programs must be able to take their place in the world of work and be able to cope with the computer revolution and the effects it is having upon the information processing of businesses.

This study was designed to look at the effect of microcomputers, minicomputers, and small computers upon small businesses. It has been

said that for small businesses to stay competitive and maintain a bright financial future, they should computerize their information systems in order to survive and compete within the business world. The purpose of this study was to obtain information concerning computer utilization by small businesses, the types of computerized business applications, and the types of data processing employees employed by small businesses. To obtain this information questionnaires were mailed to 496 small businesses in 16 states which were listed in Dun and Bradstreet's Million Dollar Directory (1982) as having annual gross revenue of less than $25 million. The data on the returned questionnaires were interpreted and analyzed to determine the utilization of small computers by small businesses.

Results of the Study

The results of the study are summarized in four sections according to 1) the type of respondents, 2) the usage and types of data processing, 3) the types of computer systems and data processing employees, and 4) the types of business applications and software utilized.

The Type of Respondents

The majority of respondents were retailing and manufacturing businesses, with 29.69 and 21.84 percent, respectively. The other respondents came from a number of different types of businesses, including wholesaling, construction, farming, grain merchandising, printing and publishing, insurance, utilities, and communications.

Fifty percent of the respondents had less than $3 million in annual gross revenue. Over three-fourths of the respondents had less than $10

million in annual gross, indicating that the majority of respondents would be considered relatively small businesses.

Fifty percent of the respondents also reported less than 25 employees, and almost three-fouths, or 71 percent, had less than 50 employees. This would indicate that the majority of respondents were also small businesses because of the small number of employees.

Questionnaires were sent to 31 small businesses in each of the 16 states, and no state had less than 10 questionnaires returned. The most returned was 18 from Ohio and North Dakota. Therefore, there was a fairly even response rate from each of the states involved in the study.

Usage and Types of Data Processing

Of those businesses that participated in the study, there was approximately a three to two ratio of utilization of data processing to non-utilization of data processing. Sixty percent, or 137, of the respondents reported they do utilize data processing. Of those 137, three-fourths of the businesses, or a total of 102, have in-house data processing. The other 35 businesses utilize either time-sharing, a computer service bureau, or other specialized type of data processing. Some businesses reported the use of more than one type of data processing. Fifty-five percent of the businesses that utilize in-house data processing were retailing and manufacturing businesses. Slightly less than one-third of the businesses utilizing in-house data processing had annual gross revenue of $5-$9.99 million.

Of the 92 businesses that reported they did not utilize any type of computerized data processing, almost 70 percent indicated they were not considering the acquisition of in-house data processing, while only 30

percent indicated they were considering in-house data processing. About one-half of those businesses not considering in-house data processing had less than $1 million in annual gross revenue, and approximately three-fourths of the businesses not considering in-house data processing had less than $3 million in annual gross revenue. Approximately two-thirds of those considering in-house data processing came from businesses with less than $3 million in annual gross sales.

Computer Systems and Data Processing Employees

The largest number of computers in use by small businesses were manufactured by IBM, which totaled 40, or 35 percent. The other two types of computers used the most were manufactured by Burroughs and Radio Shack, with 14 percent and 10 percent respectively, and the rest of the computers used were from a variety of manufacturers. The majority of the computers had less than 256K bytes of primary memory, with 74 of 115 computers, or 78 percent. This would indicate that the majority of computers used by small businesses could be classified as microcomputers and/or minicomputers. There were only 21 computers which had a primary storage of greater than 256K bytes, and 20 computers did not have their primary storage capacity reported.

Nearly all of those businesses who do have in-house data processing have purchased their computer system. There were 88 businesses that reported purchasing their system and only 15 that indicated they were making monthly lease payments. Some of the businesses reported that they had both purchased and leased equipment.

There was a large number of peripheral equipment reported, with terminals, printers, and disk drives being the most common types of

equipment. Nearly all businesses reported the use of a printer, and terminals were also very heavily used.

The type of data processing employee employed the most was the computer operator, with a total of 65 responses. Data entry clerks were the second largest type of data processing employee with 49 responses.

For future data processing employees, operators were again the type most indicated to be employed in the next five years, with data entry clerks being second. Almost half of the businesses that have in-house data processing indicated they would be hiring additional data processing employees in the future.

Business Applications and Software

Respondents were asked to indicate the types of business applications put on their computer systems initially. About twenty percent of the initial applications were accounts receivable/billing, and general ledger accounting and payroll each had utilization of 16 percent. Accounts payable and inventory control each had utilization of 11 percent. Therefore, about 75 percent of the initial applications were of these five types.

Approximately two-thirds of the current applications are from the same five types that were most used initially: accounts receivable/-billing, general ledger accounting, payroll, accounts payable/writing checks, and inventory control. The decrease in percentage would indicate that the businesses have spread their computer usage to other types of business applications. The other four types of business applications receiving the most current usage beside those five listed above are: order processing, purchasing, sales forecasting, and budgeting.

The two types of business applications with the largest gain in usage from current to future usage is budgeting and word processing. It appears that a number of businesses (30 responses) are considering the use of word processing on their computer systems quite seriously. Approximately three-fourths of the future business applications would be of the following seven types: general ledger accounting, accounts receivable/billing, accounts payable/writing checks, payroll, order processing, purchasing, and inventory control.

Slightly more than one-third of the programs for business applications were written by contract programming consultants. Approximately one-fourth of the programs came from each of two sources: programs purchased with the hardware and programs developed by in-house programming personnel.

Slightly less than one-half of the business reported that BASIC was the primary programming language used with their computer system. Twenty-five percent of the businesses used RPG, and 20 percent used COBOL.

A large number of respondents indicated they did not use a secondary programming language on their computer systems. Of those business responding to this question, the three most used secondary languages were BASIC, COBOL, and FORTRAN.

Conclusions and Recommendations

The following conclusions and recommendations are based on the results of the analysis of the utilization of small computers by small businesses as reported on the returned questionnaires, and also on the review of the related literature.

1. A majority of small businesses do currently utilize computerized data processing, and a high percentage have in-house data processing capabilities.

2. A majority of small businesses who do not have any computerized data processing capabilities indicated they are not currently considering acquiring in-house data processing.

3. Small businesses with less than $3 million in annual gross revenue are more likely not to acquire in-house data processing.

4. A high percentage of small businesses who utilize in-house data processing have computers with less than 256K bytes of primary storage, which could be classified as microcomputers and/or minicomputers.

5. Almost all small businesses have purchased their computer system rather than make monthly lease payments.

6. Terminals, printers, and disk drives are the most common types of peripheral equipment in use by small businesses.

7. Computer operators and data processing clerks are the most common types of data processing employees currently employed and also are the types most firms intend to employ in the next five years in addition to current data processing employees.

8. The types of business applications used the most are general ledger accounting, accounts receivable/billing, accounts payable/writing checks, payroll, and inventory control.

9. BASIC is the primary programming language used by small businesses.

10. More programs for business applications were written by contract programming consultants than by in-house programming personnel or purchased with the hardware.

11. A review of the related literature indicates small businesses will continue to purchase microcomputers, minicomputers, and small computers as their capabilities increase and prices decrease.

Recommendations for Future Research

1. A follow-up study should be made on the businesses who do not currently have in-house data processing capabilities to obtain information on the status of their computer utilization.

2. Studies of all sizes of businesses are needed to determine their computer utilization, types of business computer applications, and the need for qualified data processing employees.

3. Studies are needed to obtain information on the types of data processing skills graduates of business programs should have in order to be successfully employed in small businesses.

4. Studies similar to this one should be made in the future in order to continually assess the impact of microcomputers, minicomputers, and small computers in small businesses.

5. Studies similar to this one should be made in the future to study the impact of microcomputers, minicomputers, and small computers as they are used in distributed data processing networks in medium and large businesses.

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APPENDIX A

PILOT QUESTIONNAIRE AND PILOT COVER LETTER

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

April 9, 1982

Dear President and/or General Manager:

SUBJECT: COMPUTER USAGE SURVEY

Enclosed you will find a questionnaire which I have developed for my doctoral dissertation research at Oklahoma State University. The questionnaire deals with the utiliziation of computers by small businesses and their related applications. This information will be of value to all business educators who are training students to become a vital part of today's business world.

Your business has been selected to be part of a pilot study for my questionnaire. I would appreciate it very much if you would fill in the questionnaire and return it to me on or before April 19 if possible. A self-addressed, stamped envelope has been enclosed for your convenience. Please feel free to make any comments on the questionnaire, particularly concerning questions which you feel may be misleading or difficult to answer.

Thank you very much for being a part of this study, and contributing to the overall effectiveness of my research. If I can be of any further assistance to you, please do not hesitate to contact me at Oklahoma State University, 406 Classroom Building, 624-6275.

Sincerely,

Susan D. Haugen

Susan D. Haugen
Graduate Teaching Associate

G. Daryl Nord

G. Daryl Nord
Dissertation Advisor

Identification # _____

QUESTIONNAIRE ON COMPUTER USAGE BY SMALL BUSINESSES

This questionnaire is a survey of small businesses to determine the status and trends of computer usage by small businesses. Please complete the questionnaire by checking ( ) the appropriate response and filling in the blanks when necessary. Thank you.

SECTION I. GENERAL INFORMATION -- COMPANY PROFILE

1. What is the primary business purpose of your firm?

_____ Retailing
_____ Manufacturing
_____ Wholesaling
_____ Construction
_____ Transportation
_____ Printing and publishing
_____ Insurance
_____ Banking
_____ Other, please indicate:_____

2. What is your firm's annual gross revenue?

_____ Less than $5 Million
_____ $5 - $10.5 Million
_____ $11 - $15.5 Million
_____ $16 - $20.5 Million
_____ $21 - $25 Million
_____ Over $25 Million

3. What is the number of employees in your firm?

_____ Less than 10 employees
_____ 10 - 25 employees
_____ 26 - 50 employees
_____ 51 - 75 employees
_____ 76 - 100 employees
_____ 101 - 150 employees
_____ 151 - 200 employees
_____ 201 - 250 employees
_____ 251 - 300 employees
_____ 301 - 350 employees
_____ More than 350 employees

4. Check the type of computerized data processing capabilities your firm currently utilizes (or NONE, if applicable)and the number of years it has been used by your firm. (check all that apply)

		NUMBER OF YEARS UTILIZED				
		1-2	3-4	5-6	7-8	9 or more
_____	In-house data processing					
_____	Time-sharing					
_____	Computer service bureau					
_____	NONE	XXXXX	XXXXX	XXXXX	XXXXX	XXXXXXXXXX
_____	Other, please list below:	XXXXX	XXXXX	XXXXX	XXXXX	XXXXXXXXXX

IF YOUR FIRM DOES NOT HAVE ANY IN-HOUSE DATA PROCESSING CAPABILITIES AT THE PRESENT TIME, PLEASE ANSWER QUESTIONS #5, #6, AND #7 BELOW AND RETURN THE QUESTIONNAIRE.

IF YOUR FIRM DOES HAVE IN-HOUSE DATA PROCESSING CAPABILITIES AT THE PRESENT TIME, PLEASE ANSWER QUESTIONS #6 AND #7 BELOW AND COMPLETE THE REST OF THE QUESTIONNAIRE.

5. Does your firm plan to acquire in-house data processing capabilities:

_____ Within the coming 12 months
_____ Within 1-2 years
_____ Within 3-4 years
_____ Within 5-6 years
_____ More than 6 years
_____ Do not plan to acquire any in-house data processing capabilities

6. Please add any personal comments about your present or possible future computer utilization that may be helpful in evaluating this questionnaire.

____

____

____

7. If you would like a copy of the results of this questionnaire, please indicate your name and address below.

____

____

SECTION II. COMPUTER SYSTEM INFORMATION (HARDWARE)

1. If your firm has in-house data processing capabilities, check the manufacturer of the hardware, fill in the model number, and check the number of bytes of primary storage that your computer has. (Check all that apply)

			NUMBER OF BYTES OF PRIMARY STORAGE								
		MODEL NUMBER	16K or less	32K	64K	128K	256K	.5MB	1MB	2MB	More than 2MB
_____	Apple										
_____	Burroughs										
_____	Commodore-Pet										
_____	Control Data										
_____	Digital Equipment										
_____	Hewlett-Packard										
_____	Honeywell										
_____	IBM										
_____	NCR										
_____	Radio Shack										
_____	Wang										
_____	OTHER, PLEASE LIST BELOW:	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX									

2. Indentify the type of peripheral equipment your firm has as part of the total computer system as well as the number of each unit.

		NUMBER OF UNITS				
		1-3	4-6	7-9	10-12	More than 12
_____	Intelligent terminals					
_____	Dumb terminals					
_____	Printers					
_____	Card readers					
_____	Magnetic tape drives					
_____	Magnetic disk drives					
_____	Floppy disk drives					
_____	Other, please list below:	XXXXX	XXXXX	XXXXX	XXXXXXX	XXXXXXXXXXXX
	_____					
	_____					
	_____					

3. If your firm purchased its computer system, please indicate the approximate cost of all hardware. If your firm is currently leasing its computer system, indicate the average monthly lease payments. If your firm has both purchased and leased equipment, please indicate both.

TOTAL PURCHASE PRICE:	AND/OR	MONTHLY LEASE PAYMENTS:
_____ Less than $5,000		_____ Less than $500 per month
_____ $5,000 - $10,000		_____ $500 - $1,000 per month
_____ $10,000 - $20,000		_____ $1,000 - $1,500 per month
_____ $20,000 - $50,000		_____ $1,500 - $3,000 per month
_____ $50,000 - $100,000		_____ $3,000 - $5,000 per month
_____ More than $100,000		_____ More than $5,000 per month

4. Identify by checking the appropriate space the type of data processing employees your firm currently employes and the number of each type.

		NUMBER OF EMPLOYEES				
		1-5	6-10	11-15	16-20	More than 20
_____	Programmers					
_____	Systems Analysts					
_____	Operators					
_____	Data entry clerks					
_____	DP Managers					
_____	Other, please indicate:	XXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXXXXXXX
	_____					
	_____					
	_____					

5. Identify by checking the appropriate space the types of data processing employees your firm intends to employ in addition to those listed above within the next five years and the number of each type.

		NUMBER OF EMPLOYEES				
		1-5	6-10	11-15	16-20	More than 20
_____	Programmers					
_____	Systems Analysts					
_____	Operators					
_____	Data entry clerks					
_____	DP Managers					
_____	Other, please indicate:	XXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXXXXXXX
	_____					
	_____					
	_____					

SECTION III. BUSINESS APPLICATIONS AND SOFTWARE

1. Indicate which business applications your firm had on your computer system initially when it was purchased, all applications which are currently on your computer system, and all applications which your firm intends to have on its computer system within the next five years. (Be sure to check to all that apply for each category)

	INITIAL APPLICATIONS	ALL CURRENT APPLICATIONS	ALL FUTURE APPLICATIONS
General ledger accounting			
Accounts receivable/billing			
Accounts payable/writing checks			
Payroll			
Order processing			
Purchasing			
Inventory control			
Sales forecasting			
Budgeting			
Income tax preparation			
Word processing			
OTHER, PLEASE INDICATE BELOW:	XXXXXXXXXXXXXX	XXXXXXXXXXXXXX	XXXXXXXXXXXXX

2. What is the source of the business application programs on your system? (Check all that apply)

_____ Programs purchased with hardware (example, turnkey computer system)
_____ Programs developed by in-house programming personnel
_____ Programs developed by contract programming consultants
_____ Proprietary software packages developed by software houses
_____ Other, please indicate source:_____

3. Identify the primary programming language used on your computer system.

_____ COBOL
_____ BASIC
_____ FORTRAN
_____ RPG
_____ PL/1
_____ PASCAL
_____ Other, please indicate:_____

4. Identify all secondary languages used on your computer system, other than the primary language identified in Question #6 above (check all that apply).

_____ COBOL
_____ BASIC
_____ FORTRAN
_____ RPG
_____ PL/1
_____ PASCAL
_____ Other, please indicate:_____

APPENDIX B

FINAL QUESTIONNAIRE

Identification # _____

QUESTIONNAIRE ON COMPUTER USAGE BY SMALL BUSINESSES

This questionnaire is a survey of small businesses to determine the status and trends of computer usage by small businesses. Please complete the questionnaire by checking (✓) the appropriate response and filling in the blanks when necessary. Thank you for your cooperation.

SECTION I. GENERAL INFORMATION -- COMPANY PROFILE

1. What is the primary business purpose of your firm?

_____ Retailing
_____ Manufacturing
_____ Wholesaling
_____ Construction
_____ Printing and publishing
_____ Insurance
_____ Transportation
_____ Other, please indicate:_____

2. What is your firm's annual gross revenue?

_____ Less than $1 Million
_____ $1 - $1.99 Million
_____ $2 - $2.99 Million
_____ $3 - $3.99 Million
_____ $4 - $4.99 Million
_____ $5 - $9.99 Million
_____ $10 - $14.99 Million
_____ $15 - $19.99 Million
_____ $20 - $24.99 Million
_____ Over $25 Million

3. What is the number of employees in your firm?

_____ Less than 10 employees
_____ 10 - 25 employees
_____ 26 - 50 employees
_____ 51 - 75 employees
_____ 76 - 100 employees
_____ 101 - 150 employees
_____ 151 - 200 employees
_____ 201 - 250 employees
_____ 251 - 300 employees
_____ 301 - 350 employees
_____ More than 350 employees

4. Does your firm currently utilize any computerized data processing?

_____ YES IF YES, PLEASE ANSWER QUESTION #5.
_____ NO IF NO, is your firm considering acquiring in-house data processing capabilities (i.e, the purchase of a small business computer) in the near future?
_____ YES _____ NO (GO TO NEXT PAGE)

5. Check the type(s) of computerized data processing capabilities your firm currently utilizes. (Be sure to check all that apply.) For each type of data processing capability checked, check the approximate number of years it has been used by your firm.

	NUMBER OF YEARS UTILIZED				
	1-2	3-4	5-6	7-8	9 or more
_____ In-house data processing					
_____ Time-sharing					
_____ Computer service bureau					
_____ Other, please list below:					
A._____					
B._____					
C._____					

6. Please add any personal comments about your present or possible future computer utilization that may be helpful in evaluating this questionnaire.

_____

_____

_____

_____

IF YOUR FIRM DOES NOT HAVE IN-HOUSE DATA PROCESSING CAPABILITIES, PLEASE RETURN THE QUESTIONNAIRE NOW. OTHERWISE, PLEASE COMPLETE THE REST OF THE QUESTIONNAIRE.

SECTION II. COMPUTER SYSTEM INFORMATION (HARDWARE)

1. If your firm has in-house data processing capabilities, check the manufacturer of the hardware, fill in the model number, and check the number of bytes of primary storage that your computer has. (Check all that apply)

		NUMBER OF BYTES OF PRIMARY STORAGE								
	MODEL NO.	16K or less	17K-32K	33K-64K	65K-128K	129K-256K	257K-.49MB	.5MB-.99MB	1MB - 1.99MB	Over 2MB
_____ Apple										
_____ Burroughs										
_____ Commodore-Pet										
_____ Control Data										
_____ Digital Equipment										
_____ Hewlett-Packard										
_____ Honeywell										
_____ IBM										
_____ NCR										
_____ Radio Shack										
_____ Wang										
_____ OTHER, PLEASE LIST BELOW:										
A.										
B.										
C.										
D.										
E.										

2. If your firm purchased its computer system, please indicate the approximate cost of all hardware. If your firm is currently leasing its computer system, indicate the average monthly lease payments. If your firm has both purchased and leased equipment, please indicate both.

TOTAL PURCHASE PRICE:	AND/OR	MONTHLY LEASE PAYMENTS:
_____ Less than $5,000		_____ Less than $500 per month
_____ $5,000 - $9,999		_____ $500 - $999 per month
_____ $10,000 - $19,999		_____ $1,000 - $1,499 per month
_____ $20,000 - $49,999		_____ $1,500 - $2,999 per month
_____ $50,000 - $99,999		_____ $3,000 - $4,999 per month
_____ More than $100,000		_____ More than $5,000 per month

3. Indentify the type of peripheral equipment your firm has as part of the total computer system as well as the number of each type of unit.

	NUMBER OF UNITS				
	1-3	4-6	7-9	10-12	More than 12
Intelligent terminals					
Dumb terminals					
Printers					
Card readers					
Magnetic tape drives					
Magnetic disk drives					
Floppy disk drives					
Other, please list below:					
A.					
B.					
C.					
D.					
E.					

4. Identify by checking the appropriate space the type of data processing employees your firm currently employs and the number of each type.

	NUMBER OF EMPLOYEES				
	1-5	6-10	11-15	16-20	More than 20
Programmers					
Systems Analysts					
Operators					
Data entry clerks					
DP Managers					
Other, please indicate:					
A.					
B.					
C.					

5. Identify by checking the appropriate space the types of data processing employees your firm intends to employ within the next five years in addition to those listed above and number of each type.

	NUMBER OF EMPLOYEES				
	1-5	6-10	11-15	16-20	More than 20
Programmers					
Systems Analysts					
Operators					
Data entry clerks					
DP Managers					
Other, please indicate:					
A.					
B.					
C.					

SECTION III. BUSINESS APPLICATIONS AND SOFTWARE

1. Indicate which business applications your firm had on your computer system initially when it was purchased, all applications which are currently on your computer system, and all applications which your firm intends to have on its computer system within the next five years. (Be sure to check to all that apply for each category)

	INITIAL APPLICATIONS	ALL CURRENT APPLICATIONS	ALL FUTURE APPLICATIONS
General ledger accounting			
Accounts receivable/billing			
Accounts payable/writing checks			
Payroll			
Order processing			
Purchasing			
Inventory control			
Sales forecasting			
Budgeting			
Income tax preparation			
Word processing			
OTHER, PLEASE INDICATE BELOW:			
A.			
B.			
C.			
D.			
E.			

2. What is the source of the business application programs on your system? (Check all that apply)

_____ Programs purchased with hardware (example, turnkey computer system)
_____ Programs developed by in-house programming personnel
_____ Programs developed by contract programming consultants
_____ Proprietary software packages developed by software houses
_____ Other, please indicate source: _____

3. Identify the primary programming language used on your computer system.

_____ BASIC _____ PASCAL
_____ COBOL _____ PL/1
_____ FORTRAN _____ RPG
_____ Other, please indicate: _____

4. Identify all secondary languages used on your computer system, other than the primary language identified in Question #6 above (check all that apply).

_____ BASIC _____ PASCAL
_____ COBOL _____ PL/1
_____ FORTRAN _____ RPG
_____ Other, please indicate: _____

APPENDIX C

CORRESPONDENCE TO BUSINESSES--COVER LETTER AND FOLLOW-UP LETTER

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

May 12, 1982

Dear President and/or General Manager:

SUBJECT: COMPUTER USAGE SURVEY

Enclosed you will find a questionnaire which I have developed for my doctoral dissertation research at Oklahoma State University. The questionnaire deals with the utiliziation of computers by small businesses and their related applications. This information will be of value to all business educators who are training students to become a vital part of today's business world.

Your business has been selected at random from Dunn and Bradstreet's Million Dollar Directory to be a part of my research study. By your taking a few minutes of your valuable time to answer the questionnaire, you will be providing data that will be used to determine the type of information processing education that business students of today should have. Therefore, I would appreciate it very much if you would complete the questionnaire and return it to me before May 23. A self-addressed, stamped envelope has been enclosed for your convenience.

Thank you very much for being a part of this study, and contributing to the overall effectiveness of my research. If I can be of any further assistance to you, please do not hesitate to contact me at Oklahoma State University, 403 Classroom Building, 624-6275.

Sincerely,

Susan D. Haugen

Susan D. Haugen
Graduate Teaching Associate

G. Daryl Nord

G. Daryl Nord
Dissertation Advisor

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

May 26, 1982

Dear President and/or General Manager:

SUBJECT: FOLLOW-UP OF COMPUTER USAGE SURVEY

Recently you received a questionnaire requesting responses concerning your business firm's computer utilization. This is a regional survey of small businesses selected at random from Dunn and Bradstreet's Million Dollar Directory, and the information provided by the questionnaires will be of great value in completing my dissertation at Oklahoma State University. At the time this letter was mailed, a response had not been received from your business. If the questionnaire has since been completed and returned, I sincerely thank you.

Your participation in this study will contribute greatly to the effectiveness and validity of my research, and is greatly appreciated. Would you, as President and/or General Manager of this business, participate in this project by returning the enclosed questionnaire before June 4? A self-addressed, stamped envelope is enclosed for your convenience in returning the questionnaire.

Please take a few minutes today to complete and return the questionnaire.

Sincerely,

Susan D. Haugen

Susan D. Haugen
Graduate Teaching Associate

G. Daryl Nord

G. Daryl Nord
Dissertation Advisor

Enclosures

APPENDIX D

RESULTS OF COMPARISON TESTS OF SELECTED ITEMS OF THE QUESTIONNAIRE

TABLE XLV

COMPARISON OF DATA PROCESSING UTILIZATION
BY PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Utilization of Data Processing Yes	No	Total
Retailing			
Observed Frequency	38	30	68
Expected Frequency	40.70	27.30	
Percent	16.59	13.10	29.69
Row Percent	55.88	44.12	
Column Percent	27.74	32.61	
Manufacturing			
Observed Frequency	38	12	50
Expected Frequency	29.90	20.10	
Percent	16.59	5.24	21.83
Row Percent	76.00	24.00	
Column Percent	27.74	13.04	
Wholesaling			
Observed Frequency	15	12	27
Expected Frequency	16.20	10.80	
Percent	6.55	5.24	11.79
Row Percent	55.56	44.44	
Column Percent	10.95	13.04	
"Other" Businesses			
Observed Frequency	46	38	84
Expected Frequency	50.30	33.70	
Percent	20.09	16.59	36.68
Row Percent	54.76	45.24	
Column Percent	33.58	41.30	
Chi square and Total	137	92	229
significance level	59.83	40.17	100.00

Degrees of Freedom = 3 Probability = 0.0724

TABLE XLVI

COMPARISON OF DATA PROCESSING UTILIZATION
BY ANNUAL GROSS REVENUE

Annual Gross Revenue	Utilization of Data Processing Yes	No	Total
Less than $3 Million			
Observed Frequency	51	66	117
Expected Frequency	70.00	47.00	
Percent	22.27	28.82	51.09
Row Percent	43.59	56.41	
Column Percent	37.23	71.74	
$3-$9.99 Million			
Observed Frequency	52	24	76
Expected Frequency	45.50	30.50	
Percent	22.71	10.48	33.19
Row Percent	68.42	31.58	
Column Percent	37.96	26.09	
$10-$24.99 Million			
Observed Frequency	34	2	36
Expected Frequency	21.50	14.50	
Percent	14.85	0.87	15.72
Row Percent	94.44	5.56	
Column Percent	24.82	2.17	
Chi square and Total	137	92	229
significance level	59.83	40.17	100.00

Degrees of Freedom = 2 Probability = 0.0001

TABLE XLVII

COMPARISON OF ACCOUNTS RECEIVABLE/BILLING
BY PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Accounts Receivable/Billing No	Yes	Total
Retailing			
Observed Frequency	12	12	24
Expected Frequency	6.40	17.60	
Percent	11.76	11.76	23.53
Row Percent	50.00	50.00	
Column Percent	44.44	16.00	
Manufacturing			
Observed Frequency	6	26	32
Expected Frequency	8.50	23.50	
Percent	5.88	25.49	31.37
Row Percent	18.75	81.25	
Column Percent	22.22	34.67	
Wholesaling			
Observed Frequency	1	13	14
Expected Frequency	3.70	10.30	
Percent	0.98	12.75	13.73
Row Percent	7.14	92.86	
Column Percent	3.70	17.33	
"Other" Businesses			
Observed Frequency	8	24	32
Expected Frequency	8.50	23.50	
Percent	7.84	23.53	31.37
Row Percent	25.00	75.00	
Column Percent	29.63	32.00	
Chi square and Total	27	75	102
significance level	26.47	73.53	100.00

Degrees of Freedom = 3 Probability = 0.0146

TABLE XLVIII

COMPARISON OF ORDER PROCESSING
BY PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Order Processing No	Yes	Total
Retailing			
Observed Frequency	16	8	24
Expected Frequency	13.90	10.10	
Percent	15.69	7.84	23.53
Row Percent	66.67	33.33	
Column Percent	27.12	18.60	
Manufacturing			
Observed Frequency	14	18	32
Expected Frequency	18.50	13.50	
Percent	13.73	17.65	31.37
Row Percent	43.75	56.25	
Column Percent	23.73	41.86	
Wholesaling			
Observed Frequency	1	13	14
Expected Frequency	8.10	5.90	
Percent	0.98	12.75	13.73
Row Percent	7.14	92.86	
Column Percent	1.69	30.23	
"Other" Businesses			
Observed Frequency	28	4	32
Expected Frequency	18.50	13.50	
Percent	27.45	3.92	31.37
Row Percent	87.50	12.50	
Column Percent	47.46	9.30	
Chi square and Total	59	43	102
significance level	57.84	42.16	100.00

Degrees of Freedom = 3 Probability = 0.0001

TABLE XLIX

COMPARISON OF PURCHASING BY
PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Purchasing No	Purchasing Yes	Total
Retailing			
Observed Frequency	20	4	24
Expected Frequency	16.70	7.30	
Percent	19.61	3.92	23.53
Row Percent	83.33	16.67	
Column Percent	28.17	12.90	
Manufacturing			
Observed Frequency	21	11	32
Expected Frequency	22.30	9.70	
Percent	20.59	10.78	31.37
Row Percent	65.63	34.38	
Column Percent	29.58	35.48	
Wholesaling			
Observed Frequency	4	10	14
Expected Frequency	9.70	4.30	
Percent	3.92	9.80	13.73
Row Percent	28.57	71.43	
Column Percent	5.63	32.26	
"Other" Businesses			
Observed Frequency	26	6	32
Expected Frequency	22.30	9.70	
Percent	25.49	5.88	31.37
Row Percent	81.25	18.75	
Column Percent	36.62	19.35	
Chi square and significance level — Total	71 69.61	31 30.39	102 100.00

Degrees of Freedom = 3 Probability = 0.0014

TABLE L

COMPARISON OF INVENTORY CONTROL BY
PRIMARY BUSINESS PURPOSE

Primary Business Purpose	Inventory Control Yes	No	Total
Retailing			
Observed Frequency	12	12	24
Expected Frequency	10.10	13.90	
Percent	11.76	11.76	23.53
Row Percent	50.00	50.00	
Column Percent	27.91	20.34	
Manufacturing			
Observed Frequency	10	22	32
Expected Frequency	13.50	18.50	
Percent	9.80	21.57	31.37
Row Percent	31.25	68.75	
Column Percent	23.26	37.29	
Wholesaling			
Observed Frequency	1	13	14
Expected Frequency	5.90	8.10	
Percent	0.98	12.75	13.73
Row Percent	7.14	92.86	
Column Percent	2.33	22.03	
"Other" Businesses			
Observed Frequency	20	12	32
Expected Frequency	13.50	18.50	
Percent	19.61	11.76	31.37
Row Percent	62.50	37.50	
Column Percent	46.51	20.34	
Chi square and Total	43	59	102
significance level	42.16	57.84	100.00

Degrees of Freedom = 3 Probability = 0.0022

TABLE LI

COMPARISON OF ORDER PROCESSING BY
ANNUAL GROSS REVENUE

Annual Gross Revenue	Order Processing No	Order Processing Yes	Total
Less than $3 Million			
Observed Frequency	26	7	33
Expected Frequency	19.10	13.90	
Percent	25.49	6.86	32.35
Row Percent	78.79	21.21	
Column Percent	44.07	16.28	
$3-$9.99 Million			
Observed Frequency	22	20	42
Expected Frequency	24.30	17.70	
Percent	21.57	19.61	41.18
Row Percent	52.38	47.62	
Column Percent	37.29	46.51	
$10-$24.99 Million			
Observed Frequency	11	16	27
Expected Frequency	15.60	11.40	
Percent	10.78	15.69	26.47
Row Percent	40.74	59.26	
Column Percent	18.64	37.21	
Chi square and Total	59	43	102
significance level	57.84	42.16	100.00

Degrees of Freedom = 2 Probability = 0.0079

TABLE LII

COMPARISON OF PURCHASING BY
ANNUAL GROSS REVENUE

Annual Gross Revenue		Purchasing No	Purchasing Yes	Total
Less than $3 Million				
	Observed Frequency	27	6	33
	Expected Frequency	23.00	10.00	
	Percent	26.47	5.88	32.35
	Row Percent	81.82	18.18	
	Column Percent	38.03	19.35	
$3-$9.99 Million				
	Observed Frequency	30	12	42
	Expected Frequency	29.20	12.80	
	Percent	29.41	11.76	41.17
	Row Percent	71.43	28.57	
	Column Percent	42.25	38.71	
$10-$24.99 Million				
	Observed Frequency	14	13	27
	Expected Frequency	18.80	8.20	
	Percent	13.73	12.75	26.48
	Row Percent	51.85	48.15	
	Column Percent	19.72	41.94	
Chi square and significance level	Total	71	31	102
		69.61	30.39	100.00

Degrees of Freedom = 2 Probability = 0.0405

TABLE LIII

COMPARISON OF INVENTORY CONTROL
BY ANNUAL GROSS REVENUE

Annual Gross Revenue	Inventory Control No	Yes	Total
Less than $3 Million			
Observed Frequency	22	11	33
Expected Frequency	13.90	19.10	
Percent	21.57	10.78	32.35
Row Percent	66.67	33.33	
Column Percent	51.16	18.64	
$3-$9.99 Million			
Observed Frequency	16	26	42
Expected Frequency	17.70	24.30	
Percent	15.69	25.49	41.18
Row Percent	38.10	61.90	
Column Percent	37.21	44.07	
$10-$24.99 Million			
Observed Frequency	5	22	27
Expected Frequency	11.40	15.60	
Percent	4.90	21.57	26.47
Row Percent	18.52	81.48	
Column Percent	11.63	37.29	
Chi square and Total	43	59	102
significance level	42.16	57.84	100.00

Degrees of Freedom = 2 Probability = 0.0007

VITA

Susan Dawn Haugen

Candidate for the Degree of

Doctor of Education

Thesis: THE UTILIZATION OF MICROCOMPUTERS, MINICOMPUTERS, AND SMALL COMPUTERS IN SMALL BUSINESSES

Major Field: Business Education

Biographical:

Personal Data: Born in Rice Lake, Wisconsin, August 9, 1951, the daughter of Malcolm Morris and Violet Bertha Mickelson.

Education: Graduated from Barron Senior High School, Barron, Wisconsin, in May, 1969; received Bachelor of Science degree Magna Cum Laude in Business Education from the University of Wisconsin-Eau Claire, Eau Claire, Wisconsin, in 1972; received Master of Science degree in Vocational Education from the University of Wisconsin-Stout, Menomonie, Wisconsin, in 1980; completed requirements for the Doctor of Education degree at Oklahoma State University, Stillwater, Oklahoma, in July, 1982.

Professional Experience: Business Education Instructor, Chetek Senior High School, Chetek, Wisconsin, 1972-74; Senior Accountant, University of Wisconsin-Stout, Menomonie, Wisconsin, 1974-80; Graduate Leadership Development Program fellow (from U.S. Department of Education), Oklahoma State University, Stillwater, Oklahoma, 1980-81; graduate teaching associate, College of Business and College of Education, Oklahoma State University, Stillwater, Oklahoma, 1981-82.

Professional Organizations: Society of Data Educators, Delta Pi Epsilon, National Business Education Association, Mountain-Plains Business Education Association, American Vocational Association, American Society for Training and Development, Phi Delta Kappa, Phi Kappa Phi, Kappa Delta Pi.