# AN ANALYSIS OF VENDOR HARDWARE/SOFTWARE SUPPORT LEVELS FOR SELECTED SMALL BUSINESS COMPUTER INSTALLATIONS

By

JOHN NNEJI OKERE

Bachelor of Science in Business Administration

Oklahoma State University

Stillwater, Oklahoma

1985

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
May, 1987

AN ANALYSIS OF VENDOR HARDWARE/SOFTWARE SUPPORT LEVELS FOR SELECTED SMALL BUSINESS COMPUTER INSTALLATIONS

Thesis Approved:

Thesis Adviser

Dean of Graduate College

# PREFACE

This study focuses on the support levels provided by the vendor to small business computer users. An extensive literature review preceeded the findings in this study. The study was limited to selected small business computer installations in Oklahoma, and the research was conducted through the local Data Processing Management Association (DPMA) chapter members in Tulsa and Oklahoma City.

Some of the topics covered are: the reasons for computerization which covered such topics as costs, software, and hardware; history of use of small business computers; benefits from small business computers; and implementation problems associated with small business computers.

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to Dr. H. Gene Smith for his dedicated guidance and encouragement as adviser and chairman of his committee and to Dr. Marilyn G. Kletke for support on SAS (Statistical Analysis System) of the data for this study. Thanks is also given to Drs. John L. Baird and James M. Key.

Special thanks is also given to the various DPMA chapter members (Data Processing Management Association) for answering the questionnaire, and offering assistance if needed. Without their cooperation this study would not have been possible. I will also say thank you to numerous other friends for their encouragements and moral support, especially Mr. Hyacinth Anucha, you are truly a friend.

The encouragement and support of our children, David, Michelle, and Joan, was of great value many times. Most of all, my gratitude and appreciation goes to my wife, Teresa, for her loving care and the many sacrifices she has made. Also, thanks is given to my typists Norma Earp and Sherl Holesko for a job well done.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

# CHAPTER I

## INTRODUCTION

During the last decade, one of the largest growth areas in American business has been the computer industry. The growth included the development of a management tool which is changing the face of the small business community. Due to the tremendous technology push in the computer market over the last few years, numerous small businesses have decided to automate their operations.

In particular, small business users have been subjected to various difficulties because of insufficient or nonexistent internal expertise. Nonetheless, personal computers have proliferated in small businesses due to several reasons, summarized by Farhoomand and Hrycyk (pp. 16-17, 1985):

> First, computers have become affordable. The purchase price of hardware has declined at an average annual rate of approximately 16% since 1970. Second, computers are becoming increasingly "user friendly". The gap between man and machine has narrowed and users no longer need to depend on the support of distant data processing (DP) departments. Third, computers are becoming easier to purchase. The manufacturers have changed their marketing strategies and have reverted to the retail outlet as a means for distributing their products. Clearly, the retail store provides a purchase point which is very accessible and appealing. Fourth, the simple "mystique" of computers has encouraged the spread of small business computers.

It is important for the small business owner to have a computer system because of its adaptability to traditional business activities

such as updating accounts receivables, prompt billing, order entry, and inventory control (reorder point). It is also an alternative to the time-sharing system because of crowded processing conditions during peak demand hours, which generally occurs at midday (Brown, 1980).

Many individuals perceive the computer as being a device which is capable of performing miracles with the push of a button. This misconception can be attributed to the impression which manufacturers, distributors, and retailers have created in their advertisements which often lead the business person to believe that the computer technology is in a more advanced stage than it actually is.

Finally, the high inflation rates of the early 80's have forced many business environments to look at ways to cut costs, and computer advertisers have been quick to focus on this notion, emphasizing the competitive advantage of automation (Goyal, 1985). A recent study by the International Data Corporation (IDC) predicts that the sales of small business computers will reach a total of $23 billion in 1985, considering a total sales figure of $9 billion in 1983. The most significant technology advancements are anticipated to occur in the software area. Small businesses, for the most part, have the same anatomy as big businesses. Their systems -- operations, finance, marketing, and administration are alike, although the small business has these systems in microcosm. The hobby type of small computer selling for under $ 1,000.00 is usually not suited to small businesses, primarily due to data file constraints. The data files break down into two general categories:

1. Masterfiles that contain relatively permanent information, for example, the employees' names and pay rates. This information will only

change when employees change (new hires, resignations, and terminations) or if their pay rate changes.

2. Transaction files that continually change. These files contain the employees' hours worked for any one week (Smith, 1980).

Throughout this study, the term "system" or "computer system" will be used to refer to a combination of a computer central processing unit (CPU) and related hardware. Although current offerings differ widely in architecture, data formats, peripheral equipment, and software, the small business computers are generally characterized by:

1. Purchase price in the range of $ 5,000.00 to $ 1,000,000,000.00 for basic configuration.

2. Performing normal computer functions of data input/output, processing, and computation under the control of a stored program.

3. Containing memory of 128k bytes of primary memory which can be expanded to 8 million bytes, supplemented by conventional disk and tape devices.

4. Weighing less than 200 pounds and operating standard 120 volt electric power.

5. Having no special requirements for room temperature conditions.

6. Operating in both batch and on-line modes.

7. Most having capabilities for data communication and word processing.

## Statement of Problem

The problem is that small business computer users in most cases do not have adequate information for the purchase of small business systems. Problem areas include: inadequate documentation procedures,

inadequate technical support, difficult conversion procedures, inadequate user training, and applications software adaptability.

## Purpose of Study

The purpose of this study was to analyze vendor hardware/software support levels for small business computers.

## Assumptions

For the purpose of this study, the following assumptions were made:

1. There is not a direct correlation between the size of organization and the level of vendor support for small business computers;

2. Respondents have the same general reference for defining their computer hardware and software;

3. Members of Data Processing Management Associations (DPMA) are representative of small business computer installations;

4. Variance in organizational responsibilities of the respondents will not impact responses.

## Limitations

This study was limited to selected small business computer installations in Oklahoma. It was also limited to upper end microcomputers and lower end minicomputers.

## Definition of Terms

The following terms are defined for use in this study:

1. Assembly language - A programming language that is positioned between a high level language like Basic and binary computer code.

2. Batch processing - Items to be processed are collected in groups to enable fast and convenient processing.

3. Byte - Eight bits (usually), often also called a word in binary computer code.

4. Central processing unit (CPU) - Collective term for the main memory, arithmetic/logic, and control units of a computer; that is, the computer system excluding input and output devices and peripherals.

5. Disk - An input/output device that consists of a flat platter covered with a magnetic recording medium. There are fixed or hard disks and flexible or floppy disks, also called diskettes. Flexible disks are more apt to be used with small computers than hard disks; but hard disks can hold more data than floppies.

6. File - A collection of records grouped under a common heading.

7. K - Abbreviation for Kilo, prefix meaning thousands. Hence, a computer main memory specified as 128K has a capacity of 128,000 bytes.

8. Keyboard - Normally a set of alphanumerics that are produced by striking keys. The keyboard itself is similar to that of a typewriter.

9. Main memory - The internal memory of the computer contained in its circuitry, as opposed to peripheral memory (tapes and disks).

10. MOS - Metal-Oxide Semiconductor used in the primary storage section.

11. On-line - Also called random access processing. Stores records in such a way that the computer can access it directly without having to search through a sequence of other records.

12. Peripheral - A device that is not an integral part of a computer, but works in conjunction with it, like a printer or CRT.

13. Service bureau - A company which provides data processing services, but does not sell hardware.

14. Software - A generic term referring to all kinds of computer programs.

## Organization of This Study

This study is organized into five chapters. Chapter I introduces the study, assumptions, limitations, and definitions pertinent to the study.

Chapter II includes a review of literature covering topics relating to the study at hand. Chapter III reports the methodology used in the study and includes the population sample, instrumentation, and procedures used for data collection and analysis. Chapter IV presents the findings of the study. Chapter V is a summary of the study, presenting conclusions and recommendations for further research.

# CHAPTER II

# REVIEW OF LITERATURE

## Introduction

The major problem the small business computer owner faces is education. According to Nickell and Seado (1986), in their survey of 236 firms, owners who have taken a computer course have a positive attitude towards computers. In a majority of cases, owners are unfamiliar with the computer industry, systems, and applications. Misconceptions and half-truths are the rule rather than the exception for many over zealous vendors, who will sell anything to make "quick money". In this case, the rule is "caveat emptor", let the buyer beware. No matter which type of vendor, it is important to take a "show me" attitude in dealing with them (Dologite, 1984). The literature reviewed in relation to this study consists of ten main parts. The first part is an overview of the small business computer system, included in this are:

A. Memory

B. Keyboard

C. Printers.

The second part provides an overview of the reasons for computerization. In this section, the following automation issues as they relate to small business computers were addressed:

1. Costs
2. Software
3. Hardware.

The third part provides the history of use of small business computers; the fourth part provides benefits from the computer; the fifth part implementation problems for small business computers; the six part contract and vendor relations; the seventh part model proposal contract; the eighth basic internal control systems; the ninth part the future of small business computers, and the tenth part is the summary.

## The Small Business Computer Systems

The component of a small business computer system can be divided into the central processing unit (CPU), peripheral equipment, and software. The CPU contains the basic computational logic, internal memory, and control capabilities. The CPU controls the step-by-step operations of the entire system (Auerbach, 1973). The significant design features of the CPU includes addressing schemes, interrupt schemes, control logic, input/output control, and internal memory.

The importance of peripheral equipment in small business computer systems is demonstrated by the shift in the percentage of system cost toward peripheral. The software for a computer system consists of programs that control its operations. There are two basic kinds of software; (1) system software, concerned primarily with the basic operations, dedicated to a particular application. The system software is provided by the manufacturer and consists of an operating system, basic utility programs, and language translators that convert programs developed in higher-level languages to machine instructions (Dologite, 1984).

Application software consists of the programs to perform specific jobs such as payroll, billing, and inventory, and may either be developed by the user or provided by the manufacturer (Auerbach, 1973).

Memory

The user had to decide how much random access memory (RAM) to buy. Random access memory is the place in the computer where programs and data must reside before they are processed by the CPU.

Keyboard

The familiar alphabetic keyboard resembles a normal typewriter keyboard. This similarity helps shorten the learning curve because the user should be somewhat familiar with typing (The Office, 1983).

Printers

In many installations, the printer is the most error-prone hardware device. Many are not built to be used for seven or eight straight hours a day. The first thing the user should learn, according to Popular Computing (Vol. 1, Nov. 1981, pp. 10-15) is:

> ...that printers are classified as either impact or nonimpact. Typerwriters are impact printers. They form characters on a paper by striking the paper being printed. Nonimpact printers put images on paper through ink jets and laser printers. They offer higher speed but are not appropriate for normal business document printing.

Another concern is the amount of text stored in primary circuitry prior to actual printing. A common buffer size is 2K bytes, or 1-1/3 double-spaced pages. Some printers offer 48K byte buffer which

accomodate the entire document. This will release the computer to do other tasks while printing takes place.

## Reasons for Computerization

In their study, Nickell and Seado (1986, pp. 45-46) found that:

> ...the majority of small businesses and their owner/managers are using computers. However, the specific computer applications of small busness owners are different from the use of computers by managers of larger businesses.

Fleischer and Morell (1985) found that computers are used by managers of large organizations for decision making tasks. It seems that owners in small businesses are using computers for more basic functions (e.g., word processing, mailing lists, etc.) which are frequently done by lower level personnel in large organizations. This was also consistent with the studies done by Malone (1985) and Chenney (1983). In small businesses, owners must do a variety of tasks and thus need computers for a wide variety of applications. The study by Fleischer and Morell (1985) found that 68% of the owners use the computers themselves. In addition to the extensive use of computers by small business owners, most have a positive attitude toward computers and recognize the need of computers in the business environment. One small business owner remarked "...use of computers is almost a requirement for any growing, prospering business." Furthermore, Abrams (1983), in his survey of 69 businesses, found that the most compelling reasons for computerization to be those indicated in Figure 1.

| Reason | Percentage |
|---|---|
| Information overload | 35 |
| Competitive improvement | 19 |
| Hardware and software quality | 12 |
| Popularity of computers | 7 |
| High operating costs | 4 |
| Low price | 4 |
| Other | 19 |

Figure 1. Reasons for Computerization

## Cost

The survey showed that 72% of the respondents incurred a total expenditure in excess of $ 15,000 on hardware and software. The remaining 28% reported spending between $ 6,000 - $ 15,000. Clearly computerization costs extend beyond the initial acquisition of the hardware, and small businesses should be expected to spend as much as 80% of the total cost on software programs. Moreover, training, conversion, and start-up costs can range from 100 to 300% of the initial hardware costs (Abrams, 1983).

## Software

Many software products are poorly designed, tedious, and costly to use. To avoid being encumbered, a potential user should evaluate the software by doing a hands-on test (Auer and Harris, 1984). Wilson (1983), in his study, found that:

> ...66% of small businesses use packaged programs; 50% use customized programs; and 30% use self-programmed software. Over 58% of the respondents cited software as the most or

> second most important factor to consider in the computerization process. Software ranked as the third most important initial reason to computerize. This could suggest that perhaps small businesses are allured by the potential benefits of the computer rather than the actual capabilities of the software programs.

Vendors may try to get full payment when the software is installed. What about the case where the software is not fully operational for three months? The financial burden should not fall on the user (Data Pro Research Corporation, 1983; Data Processing Digest, 1984). This period should begin only after an agreed upon performance test is passed. During this period, any program corrections required to make the package operational in the user's installation should be made by the vendor regardless of cost. Dologite (1984, p. 102) stated:

> ...that payment should follow an agreed-upon schedule tied to progress milestones. When one company acquired its turnkey system, it contracted for the following payment schedule:

| Payment Amount | Scheduled Milestones |
|---|---|
| 5% | Contract signing |
| 5% | Delivery of hardware |
| 5% | Delivery of documentation and a copy of the software package |
| 15% | Installation and successful operation of system on user site |
| 45% | Acceptance by user, or not later than 30 days after installation |
| 25% | Expiration of warrenty period or the expiration of the free maintenance period |

With a sizable percentage of payment withheld to the end, the user retained the vendor's interest in keeping the installation running smoothly (Auer and Harris, 1981; Susan, 1982). To avoid being left with a incomplete or unusable system, users should closely analyze the balance sheet, company history, and financial stability of candidate

vendors (Willoughly and Jacobs, 1983). Further, a potential user should visit a vendor's facilities and meet the people who might be handling the system installation and maintenance (Devoney and Summers, 1982).

Hardware

Ward (1980, pp. 110-113), in his study, stated:

> ...that respondents reported the highest level of satisfaction with the reliability of the hardware. Less than 1% of the respondents cited a problem with the failure of computer hardware. Similarly, less than 9% felt their system was too limited and required subsequent expansion. Approximately 17% of the users indicated that the most important recommendation during the purchasing process is to select a system with adequate capacity and expandibility. Similarly, only 12% cited the computer brand as the most important recommendation during the purchasing phase. In general respondents attributed less importance to the hardware manufacturer as an important overall quality and showed concerns about software quality, technical support, and maintenance quality.

## History of Small Business Computers

Small business computer applications falls into three major categories: administration and financial applications, office automation applications, and industry specific applications. The most important applications are administrative and financial (Data Pro Research Corporation, 1983). Figure 2 indicates the most important applications of computers.

Accounting routines rank as the most popular and the most important software applications. Although these routines are indeed popular among small businesses, studies have found that accounting programs are not all of high quality. In general, they oversimplify business activity,

| Area | Percentage |
|---|---|
| Accounting | 32 |
| Word processing | 16 |
| Spreadsheet applications | 13 |
| Data base management | 12 |
| Point of sale | 4 |
| Telecommunications | 1 |
| Others | 22 |

Figure 2. Applications of the Computer.

lack in audit trails, and provide inadequate user documentation (Wilson, 1981).

## Benefits from the Computer

Among some 100 small business computer users surveyed, Farhoomand and Hrycyk (1985, p. 20) found that:

> An overwhelming 2/3 of them rated the computer as "very important", and the rest rated it as "important". Figure 3 shows the perceived benefits from the computer.

| Benefit | Percentage |
|---|---|
| Increased productivity | 29 |
| Better and faster information access | 25 |
| Improved customer service | 13 |
| Less paperwork | 9 |
| Improved competitive position | 9 |
| Decreased personnel and operating cost | 3 |
| Others | 12 |

Figure 3. Benefits from the Computer

Computers provide the greatest contribution with regard to information quality. In fact, information quality has been

> shown to be the most significant benefit resulting from computers. Similarly information overload was the most important reason which influenced the respondents to computerize. 46% of the users estimated that the computer has resulted in an overall cost savings; an additional 44% felt that they have lost in the process; and the remaining 10% estimated that they have broken even.

## Implementation Problems for Small Business Computers

As Lutchen (1983, pp. 21-25) states:

> The analysis of the implementation problems is divided into three sections: technical assistance, conversion problems, and personnel problems. The most common and the most significant problem which confronts the small businesses is the lack of good technical assistance. Poor documentation and technical support were cited as the most serious problems. The problems of technical assistance are evidenced further in the users' ratings of their satisfaction with the technical support they have experienced. Small businesses expressed their lowest level of satisfaction with respect to the quality of technical assistance. In fact, over two-thirds of the respondents ranked selection of a reliable dealer as the first or second most important consideration during the purchasing process.

However, Mahmood (1982) also found in his research that conversion problems encompass the difficulties which small businesses face during conversion from manual to automated systems. Twenty percent of the users in his research cited that it was difficult to convert from manual to the automated system. A similar percentage ranked the conversion as the first or second most important problem.

The businesses also reported that they were least satisfied with the efforts of the vendors during the conversion period, and 58% of the businesses noted that the problems persisted after the start-up phase. Steinhoff (1982) also found that users of small business computers

indicated difficulties in training personnel. In addition, employees resisted the acceptance of the computer system. This suggested that employee training is a positive step toward alleviating some of the resistance from the staff and will assist managers in their attempt to familiarize employees with the technology.

## Contracts and Vendor Relations

A mistake frequently made by the computer user is to accept all terms established by the vendor. This may happen if the user, after studying the vendor's proposal, becomes impatient at the installation phase. According to Berger (1982):

> The expenditure of time and effort in working with the vendor is a worthwhile investment and saves time and money in the long run. It could mean the difference between getting the system that will cause more problems than it solves.

Before development work proceeds, two steps must be completed: negotiations and contracting. Negotiations with the vendor are conducted to assure that there is a complete understanding between the parties concerned. This will help to assure that the user obtains precisely the system he wants (Cohen, 1980). Through discussions, Devony, Chris, and Summer (1982) say that the user and vendor will arrive at the approximate costs of many system feature and options. This will allow the user to evaluate whether a particular feature is worth the cost. The discussions will enable the user to maximize his benefits while minimizing his risks.

Furthermore, the contract is a legal agreement that specifies the rights and obligations of the buyer and seller. The user should not

assume that, after lengthy months of discussions, that a contract is not needed (Isshion, 1982). Regardless of such an understanding and the degree of confidence the user has in the vendor, there is no substitute in terms of protection to the user for a carefully considered contract. The contract should eliminate later problems by specifying the responsibilities of each part. To a certain extent, it will protect the user against financial loss due to delivery delay of the product desired. The contract will also bind the vendor to supply the system at the price negotiated and agreed upon (Cohen, 1980).

The key point in the entire procurement procedure Karasik (1984, pp. 26-28) agrees:

> ...is to concentrate on, recognize, and stimulate exactly what is wanted from a system. A collection of hardware is of no value if the software that is expected to make the system work is not functioning. The contract and negotiations must zero in at this point -- the deliverable item must be a working system, not merely a price of equipment.

## Model Proposal Contract

Brown (1980, p. 159) states:

> It has been said that the test of a successful contract is that no one ever looks at it afterward. It is important that the contract clearly describe the computer system the company expects to obtain. For this reason the request for proposal (RFP) is frequently included in its entirety as an attachment to the contract.

This commits both parties to agreeing that the contract contains a valid description of the goals and objectives that the desired system should meet. Attaching the RFP also saves substantial time and expense in the preparation of the contract. In addition to, Yates, Jones,

Vaughn, Mears, Roach, Davis, and Murphy (1985, pp. 4-5) agree that:

> ...the "implementation schedule" is another logical attachment to the contract. These documents, normally prepared with the assistance of both parties, spells out a specific schedule for the implementation of all aspects and applications of the system. Once the implementation schedule has been completed, it should be attached to the contract.

Further attachments to the contract may include sales materials, vendor proposal material, and manufacturer's literature. These items should be appended to the contract as they provide information that indicates what the user's expectations and understandings were at the time of purchase (Cohen, 1980).

The contract may also mention the "detailed system specifications", a document the user and the vendor expect to produce together in the future (Webster, 1983). Some attention should be given in the contract to program testing. The site at which the program testing will take place should be agreed upon by all parties. The contract should set out the responsibilities for preparing the physical environment for the computer system. The major burden of this usually falls on the user, but the vendor should agree to provide support, advice, and guidance. Conversion assistance should be provided by the vendor, and the nature of the assistance should be spelled out in the contract (Nanette, 1984).

Brown (1980) alluded to the fact that:

> Many of the provisions mentioned here may not be available in the standard contract the vendor presents. It is the user's responsibility to ask for them and negotiate with the vendor to provide them. It is expected that the user will make some requests over and above the vendor's contract, and many, if not most, changes will be accepted if the user is dealing with a competent and honorable vendor.

## Basic Internal Control for Small Business Computers

Fedak and Michenzi (1980, pp. 61-70) pointed out that:

> ...the use of small business computers and minicomputers has mushroomed in the past few years. Unfortunately, too many companies, especially small ones, fail to set up the proper internal controls when they enter the ranks of computer users.

Dascher and Harmon (1984, pp. 62-67), in their writing, agreed that the improved technology has spawned a curse: a gigantic control problem.

> Establishing internal controls is an accounting responsibility. Unfortuntely, concerns for computer security often only follows a large loss or disaster. Common sense suggests attention should be paid to controls and control systems on a continuing basis. While the control system is important, its structure should receive the same cost-benefit analysis as other activities in the firm. The cost of developing and operating a control system should not exceed the benefit of such activity.

Moreover, risk and uncertainty are inextricably bound up with many business decisions and actions. The risk associated with safe-guarding organizational assets and data can be lessened with similar approach to the internal control system. To the extent that risk is increased, the organization is vulnerable to undesirable consequences. In the case of computer usage, Fedak and Michenzi (1980, pp. 61-70) agreed that exposure consists of a broad set of possibilities including

1. Theft of important information for use outside the firm;
2. Destruction of information necessary to maintain the operations of the firm;
3. Alteration of data with resulting erroneous information supplied to decision makers;

4. Appropriate information either not available or not available on a timely basis and, thus, rendered useless to the firm;

5. Sensitive information dispensed inappropriately within the firm resulting in internal problems.

The most important facet of internal control is in the selection of personnel. It is a wise policy to require a mandatory background check for all computer personnel since most of these individuals will have access to sensitive data and perhaps to corporate assets. Although a small business may be limited in the number of people it can hire, rotation of duties should be implemented to the greatest extent possible (Bendyna, 1985).

Also the physical environment in which a business computer is placed has control significance. Access to the system; damage, either accidental or intentional; and protection of the computer hardware are appropriate concerns for physical controls (Darscher and Harmon, 1984).

Furthermore, small business computers are placed in a location convenient to users that may weaken, if not render nonexistent, location controls. The location of the system should limit access to a predetermined set of users. Small business computers are unique in their vulnerability to theft. In addition to the hardware loss, such thefts also mean the even costly loss of information stored in the computer (Kiochiro, 1982). Moreover, programs, supporting software, and data often are stored on small, flexible diskettes which require careful handling and storage. Diskettes should be stored securely and protected from theft, static electricity, coffee spills, and excessive handling. Furthermore, procedures should provide that data, not just the diskette,

are removed from the system before another user logs on (Fedak and Michenzi, 1980).

## Future of Small Business Computers

One of the most obvious changes in the shape of computer use in years to come will be the vast prolifertion of computers both in the home and in small businesses. By 1990, almost any business that is ran without some form of data processing or word processing will be hampered from a competitive standpoint (Smith, 1981). Also Gutek, Bikson, and Mankin (1984, pp. 10-15), in their studies, found that:

> Respondents who indicated that they were business were asked to forecast the future of small business computer usage in their businesses, within the next five years. Seventy-six percent indicated that their business would buy more computers, 14 percent said they wouldn't, and 10 percent said they did not know. Sixty-six percent of respondents who indicated that their business was not using computers said they would start using computers in the next five years, 17 percent said no, and 17 percent said they did not know. Overall, those respondents who were not currently using computers did not foresee their business beginning to use computers had the most negative attitude toward computers.

The era of mass-produced yet customized software is already here. Software in the 1990's will become more universal, more integrated, and much easier to run and understand. Also, programming languages will begin to look more like English. By the year 2050, there will be little in the way of stored information, as there is today (Smith, 1981).

## Summary

The major problem the small business computer owner will face is education. In the majority of cases, owners are unfamiliar with the

computer industry, systems, and applications. Farhoomand and Hrycyk (1985, pp. 21-22) found that:

1. The definition of software needs should be the most important consideration before acquisition.

2. Identify benefits which the user expects from automation. Furthermore, it is not uncommon to find a manager who incorrectly expects the computer to clear and sort the confusion which currently exists in the manual system.

3. The respondents indicated that their initial reasons for computerization were to mitigate information overload and to improve their competitive edge.

In general, the respondents regarded their computers as very important to their businesses. Although about half of the users felt that they have saved money by using computers, the majority of them saw the major benefits of computers in improved customer services (Wilson, 1983). The primary problems cited were poor documentation, inadequate technical support, difficulty in conversion procedures, employee's training, and software. In view of the preceeding problems encountered by the user of small business computers, solutions to the following research questions will be addressed. The research questions are:

1. What level of support was provided by the vendor for operating system problems?

2. What types of training was provided by the vendor after purchase?

3. Did the vendor provide ongoing training, and at what cost?

4. Was the vendor's response to downtime/onsite assistance reasonable?

Overall, software is regarded as the overriding consideration before, during, and after acquisition of any computer system. Small

business owners should take a close look at different parts of their operation to identify the areas that require improvement. Successful implementation of any computer system necessitates judicious computerization of only those operations that would lead to increased productivity or enhanced business effectiveness.

Similarly, personal computing is a relatively new concept for small businesses, so far only a fraction of such businesses have computerized their operations. But, the ever-decreasing cost of hardware coupled with the rapid technological advancements will make personal computers more attractive to small businesses in the future.

However, in order to exploit the full potential of possible benefits resulting from computerization, the need for careful planning before, during, and after the acquisition of a system cannot be overemphasized (Abrams, 1983).

# CHAPTER III

## METHODS AND PROCEDURE

The purpose of this study was to analyze vendor hardware/software support levels for small business computer installations. To accomplish this purpose, answers to the following research questions were needed: What are the levels of support provided by the vendor for the following:

1. Operating system problems?
2. Training after purchase?
3. Ongoing training costs?
4. Response to downtime/onsite assistance?

In order to accomplish the purpose of this study, the following steps were followed:

1. Telephone directories of the City of Stillwater, Tulsa, and Oklahoma City, were used for the purpose of identifying businesses using small business computers, and to solicit their input during the initial data gathering process for the pilot testing.

2. The various chambers of commerce for these cities were contacted for the purpose of helping to identify area small businesses.

3. The local Data Processing Management Association (DPMA) chapters of Tulsa and Oklahoma City were contacted to provide a list of small businesses in their organization.

4. The population for the study was randomly selected from the list provide by the local DPMA chapters.

5. The survey was administered to the randomly selected DPMA chapters members.

This chapter describes the research design sections including:

1. Population and sample
2. Instrumentation
3. Collection of data
4. Analysis of data

## Population and Sample

The population studied was a randomly selected group of members from the Data Processing Management Association (DPMA) chapters in Tulsa and Oklahoma City. See Appendix A for a copy of the letter. The request was granted to conduct the survey through the local DPMA chapters by the presidents of the local chapters by mailing current telephone numbers and addresses of their various members. The survey was then mailed to 100 randomly selected members of the DPMA. See Appendix B for a copy of the questionnaire.

## Instrumentation

An extensive literature search and the reviewing of numerous instruments preceeded the development of the questionnaire used for this study. The instrument was designed to meet the purpose of the study by providing information leading to the answers to the research questions. A pilot survey was conducted to determine the reasonableness and content of the questionnaire.

The pilot survey was administered to area small businesses identified in Stillwater, Tulsa, and Oklahoma City. The instrument (see

Appendix B) was a two-page questionnaire including the following sections:

1. General system profile;
2. General system usability.

Some of the questions in the questionnaire came from discussions with area businesses in Stillwater. The tests consist of eight statements in section A to be answered by either: system name, system price, length of time the system was installed, and whether or not the system was a lease/purchase agreement.

Added to the tests were 19 questions in section B, to be answered in the order of: Poor, Fair, Good, and Excellent.

The instrument was pilot tested on eight persons; four from Stillwater area businesses and two each from Tulsa and Oklahoma City area businesses. Ample time and instructions were given on how to complete the pilot test and a return self-addressed, stamped envelop was enclosed for a prompt return. Following a refinement of the pilot testes instrument, a final questionnaire was administered to 100 randomly selected DPMA members. At 95% and 99% confidence levels, targeted return rates of 57% and 81% were expected, plus some non-respondents.

After one month and ten days, a second letter of reminder was mailed to the non-respondents to meet the targeted return rate. This letter (Appendix C) explained that the cut-off date was extended, also another set of questionnaire including a stamped, self-addressed envelope for a prompt return was enclosed. The initial return before the second letter produced a return of 17%, bringing the total return to 64%. Twenty-five percent of the non-respondents disqualified themselves because of their positions in their various organizations, and returned

the questionnaire unanswered. Eleven percent failed to return their questionnaire and no reason was given.

## Collection of Data

The data reflected questionnaire responses from 100 randomly selected Data Processing Management Association (DPMA) members. Adequate time and instructions in completing the questionnaire were provided. Also, a follow-up letter was written to the non-respondents to meet the targeted return rate.

## Analysis of Data

Analysis of data consisted of computer computation of the mean, standard deviation, and percentages to determine the levels of support as identified in the research questions below.

1. What level of support was provided by the vendor for operating system problems?

2. What types of training was provided by the vendor after purchase?

3. Did the vendor provide ongoing training and at what cost?

4. Was the vendor's response to downtime/onsite assistance reasonable?

# CHAPTER IV

## RESULTS AND DISCUSSION

The result of the general system profile and general system useability conducted through the local Data Processing Management Association chapters (DPMA) are presented in this chapter. The purpose of the study was to analyze vendor hardware/software support levels for small business computers. Discussed in this chapter are:

1. Response rate
2. Results of study
3. Summary.

### Response Rate

The number and percentage of total respondents are presented. A total of 100 subjects attempted to participate in the study and of this number, 10 questionnaires failed to include useable data, 5 of the remaining 90 disqualified themselves on the basis of the positions they held in their various organizations, and 21 questionnaires failed to return and there was no reason given. Thus, 64 subjects that responded was significant at $p > 0.05$ level. See Appendixes D and E for the raw data breakdown of the respondents. The mean, and coefficient of variation for this study, based on the general system useability are presented in Table I.

TABLE I

GENERAL SYSTEM USEABILITY
ALL PARTICIPANTS COMBINED

| Variable | Mean | Coefficient of Variance |
|---|---|---|
| V1 | 3.09 | 13.77 |
| V2 | 3.12 | 14.54 |
| V3 | 2.87 | 18.07 |
| V4 | 2.92 | 18.60 |
| V5 | 2.87 | 18.07 |
| V6 | 2.70 | 22.53 |
| V7 | 3.07 | 24.08 |
| V8 | 2.87 | 22.77 |
| V9 | 2.79 | 26.41 |
| V10 | 2.54 | 29.62 |
| V11 | 2.54 | 31.23 |
| V12 | 2.71 | 26.60 |
| V13 | 2.92 | 20.50 |
| V14 | 3.09 | 21.33 |
| V15 | 2.92 | 22.24 |
| V16 | 2.98 | 19.34 |
| V17 | 2.95 | 17.52 |
| V18 | 2.82 | 20.46 |
| V19 | 2.98 | 13.99 |

Table II indicates the breakdown of the firms by the brand of computer used. Obviously, these categories are not mutually exclusive and some firms operate more than one computer.

Table III shows the number of years (i.e., age of system) the firms have had their computers. As can be seen, over two-thirds of the users' computers are more than two years old.

The respondents were asked to state whether their computer system was a lease/purchase agreement. From a total of 64 respondents, 12

TABLE II

PROFILE OF FIRMS BY COMPUTER USED

| Firms | Computers | Percentages |
|---|---|---|
| IBM | 38 | 48.73% |
| DEC | 8 | 10.26% |
| Honneywell | 6 | 7.69% |
| Burroughs | 5 | 6.41% |
| Data General | 2 | 2.56% |
| NCR | 2 | 2.56% |
| Others | 17 | 21.79% |

TABLE III

AGE OF COMPUTER AT PRESENT INSTALLATION

| Age of System in Years | Percentage |
|---|---|
| 1 | 19% |
| 2 | 49% |
| 3 | 8% |
| 4 | 3% |
| 5 | 10% |
| 6 | 11% |

stated that their system was a lease/purchase agreement. The lease/purchase prices ranged from $ 700.00 to $ 2,615.00 per month.

The respondents were asked whether their system was an outright purchase. Twenty-three of them (i.e., 35%) said it was an outright purchase. The prices ranged from $ 3,000.00 to $2 million. A total of 29 respondents did not know the price of their system or did not want to breach any confidentiality. Also, no respondents indicated that their system was a lease only option.

Most of the systems in this study were either a combination of lease/purchase agreement or an outright purchase and the larger units did not impact this study. Rather the larger systems gave their users more computer power in terms of memory sizes, so that more than one operation could be carried out simultaneously. Table IV shows the breakdown by memory sizes the computers for this study. As can be seen, although the IBM's have more memory capacity than any other system in this study, there was no indication that the larger systems impacted the study.

TABLE IV

MEMORY SIZE BY NAME OF SYSTEM

| | |
|---|---|
| IBM | 12.5 Megabytes |
| DEC | 1.5 Megabytes |
| Honneywell | 3.3 Megabytes |
| Burroughs | 2.8 Megabytes |
| Data General | 1.1 Megabytes |
| NCR | 1.1 Megabytes |
| Others | 9.5 Megabytes |

The evidence inter alia (among other things) was that the more popular manufacturers dominated the prices, memory sizes, etc., which is reflected above.

The standard deviation for this study can be found in Appendix E on page 57. The standard deviation is equal to the square root of the mean square of error (MS(error)), and it is also the standard deviation of the dependent variable.

The coefficient of variance (C.V.) is used to describe the amount of variation in the population. It is equal to the standard deviation of the dependent variable times 100. The coefficient of variation is a preferred measure because it is unitless. The coefficient of variation for this study can be found in Table I above and in Appendix E on page 57 of this study.

## Results of Study

The analysis of data was a computer generation of all the mean, standard deviation, coefficient of variance, and standard error of mean of all respondents for N = 64 (see Table I for the mean based on 64 respondents). Based on a maximum score of 4 points per question, question numbers 10, 11, and 6 which addressed a) training after purchase, b) ongoing training and cost, and c) documentation, received mean scores of 2.54, 2.54, and 2.70 respectively which are fairly poor in relative terms. These questions had standard deviations of 0.75, 0.79, and 0.61 and coefficient of variance of 29.62, 31.23, and 22.53. The coefficient of variance for these questions suggests some variability among respondents on the weights given the questions, although their mean score showed them to have fairly poor scores in relatively terms.

On the other hand, question numbers 2, 1, and 7 which addressed; a) keyboard useability, b) ease of operation, and c) hardware reliability received mean score of 3.12, 3.09, and 3.07 respectively which are high scores in relative terms. Keyboard useability is an important part of any system because of ease of keystroke operations. Ease of operations and hardware reliability are two important factors that should be considered in any system. Although their respective coefficients of variance with scores of 14.54, 13.77, and 24.08 suggests some variability among respondents. It is expected that vendors should provide full support for their customers, with a maximum support level of 100%, however, a support level of 2.98 represents the overall satisfaction level as determined by question 19 from Table I and is considered to population mean for this study.

Question number 16 which addressed; telephone support in time of emergency received mean score of 2.98. Telephone support in time of emergency, especially during peak hours, is very crucial to the small business computer users.

Question number 17, which addressed; system interactiveness, received a mean score of 2.95. This score is relatively high in relation to other scores on Table I.

Question numbers 4, 13, and 15, which addressed; a) rate of disk access, b) hardware startup time, and c) machine adequency in terms of users throughput rates and interactive/batch processing, received mean scores of 2.92 each. Although these questions had high scores on their various coefficients of variance, rate of disk access and hardware startup time are very important because rate of disk access determines how fast information can be retrieved from the disk. Also, hardware

startup time determines how long it takes the computer to startup after the normal logon procedures have been completed and it also determines disk access rate. Throughput and interactive/batch processing determines the mode in which the system operates. Interactive or batch indicates whether the computer processing is simultaneous or one at a time.

Question numbers 3 and 8, which addressed; a) operating system problems and b) timeliness of response, received mean scores of 2.87 each. Operating system problems are the worst of all problems that can befall any computer system large or small. Timeliness of response is whether the vendor's support staff responds to the user's problems on time or not. Both of these questions received a relatively fair score.

Question number 18, which addressed; compatibility of system with other existing systems, received a mean score of 2.82. The survey indicated that from names of systems received in this study, 80% of the systems were a combination of two or more system components.

Question numbers 9 and 12, which addressed; a) ease of conversion and b) preventive maintenance of hardware, received mean scores of 2.79 and 2.71 respectively. Ease of conversion and preventive maintenance of hardware are important to the vendor because of reputation and customer relations. The vendor should improve more on these two aspects of support, although both scores were relatively fair.

Two factors of interest were observed in both the pilot test questionnaire and the final questionnaire. Both questionnaires indicated fairly poor scores in relative terms for training after purchase and ongoing training and cost. The same computational methodology was used on the pilot test questionnaire to arrive at this analogy. Both

questions received a mean score of 2.54 each on the pilot test and the final questionnaire.

## Summary

The four research questions addressed were:

1. What level of support was provided by the vendor for operating system problems?

2. What types of training was provided by the vendor after purchase?

3. Did the vendor provide ongoing training and at what cost?

4. Was the vendor's response to downtime/onsite assistance reasonable?

The results of this study indicated:

1. The larger systems did not impact on this study.

2. No one computer manufacturer/vendor dominated in support levels provided, although in some cases, IBM vendors did better in regards to operating system problems and response to downtime/onsite assistance.

3. The weak areas are in documentation, training after purchase, and ongoing training and cost.

4. There was a substantial range of variability among respondents in some of the questions, as indicated by the various coefficient of variance.

# CHAPTER V

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary and conclusions for this study. Included also are the recommendations for further research and implications.

### Summary

The purpose of this study was to identify vendor hardware/software support levels for small business computers. The questionnaire used for this study consisted of eight statements in section A to be answered by either the system name, system price, length of time the system was installed, and whether or not the system was a lease/purchase agreement. Added to the questionnaire were 19 questions in section B, to be answered in the order of: Poor, Fair, Good, and Excellent. The four research questions were part of the 19 questions. The two page questionnaire was mailed to 100 randomly selected Data Processing Management Association (DPMA) chapter members in Tulsa and Oklahoma City.

The four research questions addressed were:

1. What level of support was provided by the vendor for operating system problems?

2. What types of training was provided by the vendor after purchase?

3. Was the vendor's response to downtime/onsite assistance reasonable?

The mean score of the research questions were arrived at through a SAS (Statistical Analysis System) computer computation, see Table I for complete computations.

| Research Question | Mean Score |
|---|---|
| Operating system problems | 2.87 |
| Training after purchase | 2.54 |
| Ongoing training and cost | 2.54 |
| Response to downtime/onsite assistance | 3.09 |

The larger systems did not impact the mean score for this study, however, the larger systems did provide their users with more computer power.

## Conclusions

The conclusions for this study are:

1. The level of support by the vendor was generally fair.

2. The support for training after purchase and ongoing training and cost were least satisfactory.

3. Training support was the least acceptable of all the features of a small business computer.

4. All of the research questions were answered with scores ranging from 2.54 to 3.09 indicating the desirability for better support levels. Although operating system problems received a fair score of 2.87, it is recognized that without a smooth running operating system, the software

to run the programs will not work properly. Therefore, operating system problems need further improvement in regards to support levels. Response to downtime/onsite assistance received a high score in relative terms and should be maintained at least at that level of support.

Any organization needs some form of training, especially when converting from a manual system to an automated system. The vendor should provide both training after purchase and ongoing training at a cost predetermined and agreed upon by the vendor and the user. It is anticipated that a small business computer user may not have enough experience/training during the conversion period. Documentation is very important because without proper documentation several software and hardware problems may not be traceable. It is, therefore, important to both vendor and user to have adequate procedures to document any problems that may arise during the time the system is being tested and during the conversion period. Keyboard useability is an important part of any system because of ease of operation. A straight, flat keyboard creates problems for the hands after long usage. Ease of operation and hardware reliability are two important factors that should be considered in any system. The operation of any computer system should be easy, especially in the case of a small business computer, as any complex operational procedure will mean longer time for the user to master the system.

It is expected that vendors should provide full support for their customer, ideally at a maximum support level of 100%. However, a support level with a mean score of 2.98 is considered fair support in relative terms.

## Recommendations

These recommendations were made for further research.

### Further Research

The investigator believes future research should include the following:

1. This study should be carried out across the nation through various Data Processing Management Association (DPMA) chapter members, to determine if a similarity exists in the levels of support as identified in this study.

2. This study should be repeated after a couple of years to determine whether there is a change in the level of support.

3. Further research should be conducted to determine whether the size of the organization impacts the level of support received.

## Implications

Several industry-wide trends have emerged in the small business computer marketplace. Once diverse, the hardware and software features now offered by vendors show decreasing differentiation. Generic "casual" software programs have become the standard and, with the emergence of several major original equipment manufacturers each supplying similar equipment, hardware distinctions have begun to blur as well. The industry battleground is shifting to the support sector, as evidenced in this study.

While varying from vendor to vendor, customer support, customer

training, documentation, hotlines, and onsite assistance will continue to be the dominating factors.

Vendors will come to see customer support as the major differentiation of their product in the marketplace and as the primary reason for customers to purchase their products.

In relation to this trend, two major issues have emerged:

1. In relation to customer satisfaction, what support level must be provided to help customers fully utilize their purchase and achieve maximum satisfaction both with the product and their vendor?

2. In relation to profitability, to what extent must vendors provide support services included or "bundled" with the sale of the product, and to what extent can vendors offer support services as value-added opportunities for additional revenue?

As the market for small business computers continues to grow, customer training will be seen as a partner in the customer support function, leading to greater satisfaction and pricing of services offered, and the establishment of customer training either as a service function or profit center within the vendor's organization. Reference manuals will continue to be the basic industry standard, augmented heavily with training manuals, combined with onsite assistance and classroom training.

The question of bundled versus unbundled services will continue to plague the industry as the confusion continues as to what should be provided as bundled versus unbundled services and what should the charges be for these services.

BIBLIOGRAPHY


Abrams, C.L. "Microcomputers for the Small Business." The Practical Accountant, 16(8)(July 1983), 55-56.

Allen, B. "The Biggest Computer Fraud: Lessons for CPA°s." Journal of Accountancy, 18(1977), 52.

Auer, Joseph and Charles Edison Harris, Esq. Computer Contract Negotiations. New York: Van Nestrand Reinhold Company, 1981.

Auerbach Publishers, Inc., (eds.). Small Business Computers, (1st edition). Philadelphia: Auerbach Publishers, Inc., 1973.

"Automated Office Solutions." Datapro Research Corporation. (January 1984).

Barcomb, David. "Office Automation." Digital Corporation. (February 1981).

Battersby, E. "The Value of Power: General Automation." Data Management, 18(1974), 25-29.

Berger, Ivan. "How to Select a Computer System That°s Right for Your Business." Popular Computing, (July 1982).

Blumenthal, S. Understanding and Buying a Small Business Computer. New York: Sams, 1980.

Brown, C.W. "Using a Grid to Compare a Number of Alternatives." The Small Business Computer Simplified. New York: The Free Press, 1980.

Carver, D.K. Introduction to Business Data Processing. New York: John Wiley and Sons, 1979.

Cashman, M. "Small Business Computers." Datamation, 14(1972).

Clifton, H.D. Choosing and Using Computers, (1st edition). London: Business Books Publishing, 1975.

Cohen, J.A. How to Computerize Your Small Business. New York: Prentice-Hall, 1980.

Dascher, Paul E. and W. Ken Harmon. "The Dark Side of Small Business Computers." Management Accounting, May 1984.

Devoney, Chris and Richard Summer. "IBM Personal Computer." Que, (January 1982).

Durbec, M.R. "Choosing Computers: Now It°s Your Turn." Small Business Computers Magazine, 62(1978), 18.

Farhoomand, F. and G.P. Hrycyk. "The Feasibility of Computers in the Small Business Environment." American Journal of Small Business, ix, #4 (Spring 1985).

Fedak, C.E. and A.R. Michenzi. "Basic Internal Control for the Small Computer User." The Practical Accountant, 13(June 1980), 61-70.

"Guide to Computer Program Directories." U.S. National Bureau of Standard. (January 1982).

Gutek, B.A., T.K. Bikson, and D. Mankin. "Individual and Organizational Consequences of Computer-based Office Information Technology." Applied Social Psychology Annual, Vol. 5. Beverly Hills: Sage Publication, 1984.

Hensen D. "Real Managers Use Personal Computers." Que, (March 1983).

Hensen J. "Microcomputers: Are They Ready for Business?" Small Business World, (December 1979), 20-21.

"How to Buy Software Packages." Datapro Research Corporation. (January 1983).

Isshion, K.R. Small Business Computers: A Guide to Evaluation and Selection. New York: Prentice-Hall, 1982.

Joel, S.A. "Is Your Computer Insecure?" Datamation, 31 (May 1985).

Karasik, M.S. "Selecting a Small Business Computer." Harvard Business Review, 62(1984), 26-28.

Kenny, D.P. Future Trends in Small Business Computers, (1st edition). New York: Amacom, 1973.

Lutchen, M. "Microcomputer Implementation: A Sure Fire Strategy." Corporate Accounting, (1983), 21-35.

Madron, T. Microcomputers in Large Organizations. New York: Prentice-Hall, 1983.

Mahmood, A. "Choosing Computer Sources for Small Business." Journal of Systems Management, 33(3)(July 1982), 22-24.

Malone, S.C. "Computerizing Small Information Systems." Journal of Small Business Management, 23(2)(1985), 10-16.

Nanette, B. "Minimizing Loss Through Risk Assessment." Infosystems, 31 (2)(December 1984).

Nickell, G.S. and J.N. Pinto. "The Computer Attitude Scale (CAS)." Paper Presented at Southwestern Psychological Association. New Orleans, April 1984.

Perry, W.E. Microcomputer Software Selection Guide. San Francisco: QED, 1983.

Petro, L.W. "Minicomputer Systems for Small Businesses." Journal of Small Business Management, 21(1983), 26-28.

Sachs, Jonathon. Your IBM PC Made Easy. New York: McGraw-Hill, 1983.

Schachter, E.R. "Software Escrow." Data Processing Digest, 11(June 1985).

Severino, E.F. "What is a Small Business Computer?" Data Management, 8 (November 1980), 8-12.

Sharp, W.F. "The Economics of Computers." New York: SBA Columbia University Press, 1969.

Business Loans. Washington, D.C., (1973), 4.

"Small Business Computer Specifications." Datapro Research Corporation. (January 1980).

"Small Business in the American Economy: SBA Business Loans." Annual Report, FY1973 (Washington, D.C.), SBA, (September 1973).

Small Business Loans Annual Report, (1973), 5.

Smith, B.R. Small Computers in Small Business. Brattleboro, Vermont: The Stephen Green Press, 1981.

Snyder, J.E. "Small Computers for Small Business." Journal of Systems Management, 18(1975), 26-28.

Steinhoff, D. Small Business Management Fundamentals. New York: McGraw-Hill, 1982.

Steven, L.M. Computers, Data Processing and the Law. St. Paul: West Publishing Company, 1981.

"User Ratings of Microcomputers." Datapro Research Corporation. (February 1984).

Verbit, A.C. and B. Cynwyd. "What to Consider When Opting for a Small Business Computer." The Office, 93(1981), 110.

Ward, M. "How to Buy a Micro." Management Today, (December 1980), 110-113.

Webster, Tony. Microcomputer Buyer°s Guide. New York: McGraw-Hill, 1981.

Williams, W.P. "History of Use of Small Business Computers." (Unpublished M.S. thesis, University of North Carolina at Chapel Hill, 1981).

Willoughly, William Edward and Nancy Foster Jacobs. The ABC°s of the IBM. New Jersey: Sybex, 1983.

Wilson, J. "How to Cure Small Business Automation Headaches." Management Accounting, 65(5)(May 1983), 46-49.

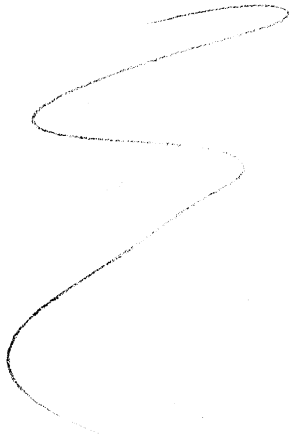
Winkel, M., G. Nickell, J. Pinto, D. Novak, L. Contrares, and P. Seado. "Attitude Toward Computers: A Cross-Cultural Comparison." Paper presented at Southwestern Psychological Association. Austin, Texas, April, 1985.

Yates, J.C. and H.J. Jones, III, attorneys; Vaughn, Mears, Roach, Davis, and Murphy. "Computer Acquisitions: The Role of Due Diligence." Computer Negotiations Report. Data Processing Digest, 8(1985), 4-5.

Zaks, Rodney. Your First Computer. New Jersey: Sybex, 1980.

# APPENDIXES

# APPENDIX A



*Oklahoma State University*

SCHOOL OF OCCUPATIONAL AND ADULT EDUCATION
Systems Design and Computer Services

STILLWATER, OK 74074
1500 W. SEVENTH STREET
(405) 624-6768

June 5, 1986

Dear Fellow DPMA Member,

I am a graduate student in the School of Occupational and Adult Education at Oklahoma State University, in Stillwater, Oklahoma. My research topic is "An Analysis of Vendor Hardware/Sofware Support Levels for Selected Small Business Computer Installations". You have been selected to participate in this research study through your affiliation with the local DPMA Chapter.

Enclosed is a copy of the questionnaire designed for the purpose of soliciting information for the study. I will be grateful if you would complete the questionnaire and return it in the self-addressed, pre-stamped envelope provided for your convenience. Your response is very crucial to the accuracy of the study. A target date of June 30 has been established and your response is highly appreciated.

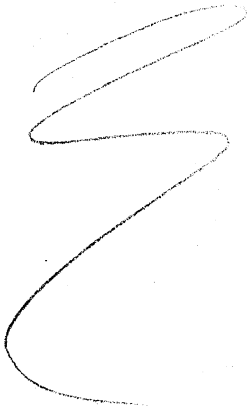
The researcher assures complete confidentiality of each respondent. A summary of this study will be made available to you upon request.

Sincerely,

John N. Okere,
Master Candidate
School of Occupational and Adult Education, College of Education

H. Gene Smith,
Associate Professor
School of Occupational and Adult Education, College of Education

APPENDIX B



Oklahoma State University

SCHOOL OF OCCUPATIONAL AND ADULT EDUCATION
Systems Design and Computer Services

STILLWATER, OK 74074
1500 W. SEVENTH STREET
(405) 624-6768

## A. GENERAL SYSTEM PROFILE

1. Who is the manufacturer of your system?

2. What type of system (name & model) do you have?

3. How many units do you have?

4. What is the memory capacity in your system (average if more than one)?

5. What is the age of your system?

6. Was part or all of your system acquired by outright purchase?----
   What was the purchase price?----------
   What is the monthly maintenance cost of the purchased equipment?-------

7. Is part or all of your system leased?--------
   What is the monthly lease rate?----------
   What is the monthly maintenance cost?----------

8. Is your system being acquired on a lease/purchase agreement?-----
   What is the annual payment rate?---------
   What is the lease/purchase period?----------
   What is the monthly maintenance cost?---------

Oklahoma State University

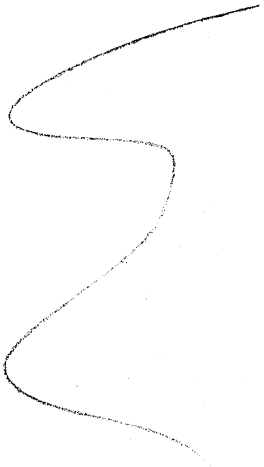
SCHOOL OF OCCUPATIONAL AND ADULT EDUCATION
Systems Design and Computer Services

STILLWATER, OK 74074
1500 W. SEVENTH STREET
(405) 624-6768

B. GENERAL SYSTEM USABILITY

| | Poor | Fair | Good | Excellent |
|---|---|---|---|---|
| 1. Ease of Operation | | | | |
| 2. Keyboard Usability | | | | |
| 3. Operating System Problems | | | | |
| 4. Rate of Disk Access | | | | |
| 5. Error Detection | | | | |
| 6. Documention | | | | |
| 7. Hardware Reliability | | | | |
| 8. Timeliness of Response | | | | |
| 9. Ease of conversion | | | | |
| 10. Training after Purchase | | | | |
| 11. Ongoing Training and Cost | | | | |
| 12. Preventive Maintenance of Hardware | | | | |
| 13. Hardware Startup Time | | | | |
| 14. Response to Downtime/Onsite Assistance | | | | |
| 15. Machine Adequacy in Terms of Users Throughput Rates Interactive/Batch - Processing | | | | |
| 16. Telephone Support in Time of Emergency | | | | |
| 17. System Interactiveness | | | | |
| 18. Compatibility of System with other Existing Systems | | | | |
| 19. Overall Satisfaction | | | | |

# APPENDIX C



*Oklahoma State University*

SCHOOL OF OCCUPATIONAL AND ADULT EDUCATION
Systems Design and Computer Services

STILLWATER, OK 74074
1500 W. SEVENTH STREET
(405) 624-6768

July 15, 1986

Dear Fellow DPMA Member,

I am a graduate student in the School of Occuptational and Adults Education at Oklahoma State University, in Stillwater, Oklahoma. You were mailed a set of questionaire designed for the purpose of soliciting information for my study. This questionaire was mailed around the 5th of June, 1986. I am still interested in your response to the questionaire. Your response is very crucial to the accuracy of the study. Enclosed is a self-addressed stamped envelope for your convenience. The researcher assures complete confidentiality of each respondent. A summary of this study will be made available to you upon requests.

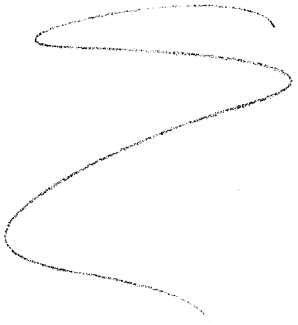
Sincerely,

John N. Okere
Master Candidate
School of Occupational and Adult
Education, College of Education

JO:si

Encl.

# APPENDIX D



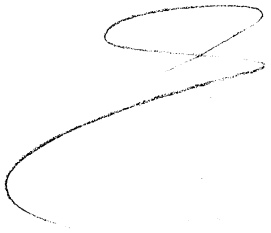
| OBS | QN | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 | V11 | V12 | V13 | V14 | V15 | V16 | V17 | V18 | V19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |
| 2 | 2 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| 4 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 2 | 3 | 3 | 3 | 2 | 4 |
| 5 | 5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| 6 | 6 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 3 |
| 7 | 7 | 3 | 3 | 3 | 3 | 2 | 3 | 4 | 3 | 2 | 1 | 1 | 4 | 2 | 4 | 2 | 2 | 3 | 2 | 3 |
| 8 | 8 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 9 | 9 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 10 | 10 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 11 | 11 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 12 | 12 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 13 | 13 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | 14 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15 | 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 16 | 16 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 17 | 17 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 18 | 18 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 19 | 19 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 20 | 20 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 21 | 21 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 22 | 22 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 23 | 23 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 24 | 24 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 25 | 25 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 26 | 26 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 27 | 27 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 |
| 28 | 28 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 3 |
| 29 | 29 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |
| 30 | 30 | 3 | 3 | 2 | 2 | 4 | 3 | 4 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 3 | 3 | 2 | 3 | 3 |
| 31 | 31 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3 |
| 32 | 32 | 3 | 3 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 2 | 3 | 3 | 3 |
| 33 | 33 | 3 | 3 | 2 | 4 | 3 | 1 | 4 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 3 |
| 34 | 34 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 35 | 35 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 4 | 2 | 3 |
| 36 | 36 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| 37 | 37 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 38 | 38 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| 39 | 39 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 1 | 1 |
| 40 | 40 | 3 | 3 | 3 | 3 | 3 | 2 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 |
| 41 | 41 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 |
| 42 | 42 | 2 | 2 | 2 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| 43 | 43 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 2 | 2 | 3 | 4 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 |
| 44 | 44 | 3 | 4 | 4 | 4 | 3 | 2 | 4 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | 45 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 4 | 1 | 2 | 2 | 2 | 3 |
| 46 | 46 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 4 | 3 | 3 | 3 |
| 47 | 47 | 3 | 3 | 4 | 3 | 2 | 2 | 4 | 3 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| 48 | 48 | 3 | 3 | 3 | 2 | 2 | 3 | 4 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 3 | 3 | 2 | 3 |
| 49 | 49 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 |
| 50 | 50 | 4 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 3 |
| 51 | 51 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 4 | 3 | 2 | 2 | 3 | 3 | 2 | 4 | 3 | 2 | 3 | 3 |
| 52 | 52 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| 53 | 53 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 54 | 54 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Appendix D

| OBS | ON | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 | V11 | V12 | V13 | V14 | V15 | V16 | V17 | V18 | V19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 55 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 56 | 56 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 57 | 57 | 3 | 3 | 3 | 3 | 2 | 2 | 4 | 3 | 4 | 1 | 1 | 1 | 3 | 4 | 3 | 4 | 3 | 2 | 3 |
| 58 | 58 | 2 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 |
| 59 | 59 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 2 | 4 |
| 60 | 60 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 3 |
| 61 | 61 | 3 | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 4 | 3 | 3 |
| 62 | 62 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| 63 | 63 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| 64 | 64 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 |

Appendix D

APPENDIX E



| VARIABLE | N | MEAN | STANDARD DEVIATION | MINIMUM VALUE | MAXIMUM VALUE | STD ERROR OF MEAN | SUM | VARIANCE | C.V. |
|---|---|---|---|---|---|---|---|---|---|
| QN | 64 | 32.50000000 | 18.61898673 | 1.00000000 | 64.00000000 | 2.32737334 | 2080.0000000 | 346.66666667 | 57.289 |
| V1 | 64 | 3.09375000 | 0.42608405 | 2.00000000 | 4.00000000 | 0.05326051 | 198.0000000 | 0.18154762 | 13.772 |
| V2 | 64 | 3.12500000 | 0.45425676 | 2.00000000 | 4.00000000 | 0.05678210 | 200.0000000 | 0.20634921 | 14.536 |
| V3 | 64 | 2.87500000 | 0.51946248 | 2.00000000 | 4.00000000 | 0.06493281 | 184.0000000 | 0.26984127 | 18.068 |
| V4 | 64 | 2.92187500 | 0.54349508 | 2.00000000 | 4.00000000 | 0.06793689 | 187.0000000 | 0.29538690 | 18.601 |
| V5 | 64 | 2.87500000 | 0.51946248 | 2.00000000 | 4.00000000 | 0.06493281 | 184.0000000 | 0.26984127 | 18.068 |
| V6 | 64 | 2.70312500 | 0.60892013 | 1.00000000 | 4.00000000 | 0.07611502 | 173.0000000 | 0.37078373 | 22.527 |
| V7 | 64 | 3.07812500 | 0.74118497 | 1.00000000 | 4.00000000 | 0.09264812 | 197.0000000 | 0.54935516 | 24.079 |
| V8 | 64 | 2.87500000 | 0.65465367 | 1.00000000 | 4.00000000 | 0.08183171 | 184.0000000 | 0.42857143 | 22.771 |
| V9 | 64 | 2.79687500 | 0.73850315 | 1.00000000 | 4.00000000 | 0.09231289 | 179.0000000 | 0.54538690 | 26.405 |
| V10 | 64 | 2.54687500 | 0.75445108 | 1.00000000 | 4.00000000 | 0.09430638 | 163.0000000 | 0.56919643 | 29.623 |
| V11 | 64 | 2.54687500 | 0.79541718 | 1.00000000 | 4.00000000 | 0.09942715 | 163.0000000 | 0.63268849 | 31.231 |
| V12 | 64 | 2.71875000 | 0.72306117 | 1.00000000 | 4.00000000 | 0.09038265 | 174.0000000 | 0.52281746 | 26.595 |
| V13 | 64 | 2.92187500 | 0.59906508 | 1.00000000 | 4.00000000 | 0.07488313 | 187.0000000 | 0.35887897 | 20.503 |
| V14 | 64 | 3.09375000 | 0.65993626 | 1.00000000 | 4.00000000 | 0.08249203 | 198.0000000 | 0.43551587 | 21.331 |
| V15 | 64 | 2.92187500 | 0.64990079 | 1.00000000 | 4.00000000 | 0.08123760 | 187.0000000 | 0.42237103 | 22.243 |
| V16 | 64 | 2.98437500 | 0.57713544 | 1.00000000 | 4.00000000 | 0.07214193 | 191.0000000 | 0.33308532 | 19.339 |
| V17 | 64 | 2.95312500 | 0.51730951 | 1.00000000 | 4.00000000 | 0.06466369 | 189.0000000 | 0.26760913 | 17.517 |
| V18 | 64 | 2.82812500 | 0.57885183 | 1.00000000 | 4.00000000 | 0.07235648 | 181.0000000 | 0.33506944 | 20.468 |
| V19 | 64 | 2.98437500 | 0.41755857 | 1.00000000 | 4.00000000 | 0.05219482 | 191.0000000 | 0.17435516 | 13.991 |

## Appendix E

VITA

John Nneji Okere

Candidate for the Degree of

Master of Science

Thesis: AN ANALYSIS OF VENDOR HARDWARE/SOFTWARE SUPPORT LEVELS FOR SELECTED SMALL BUSINESS COMPUTER INSTALLATIONS

Major Field: Human Resources Development

Biographical:

Personal Data: Born in Umuewere, Nguru Imo State, January 22, 1958, the son of Caleb and Patience Okere. Married Teresa U. Okere on April 25, 1980.

Education: Received Ordinary National Diploma (OND) in Data Processing from East Ham College of Technology, London, England; received Bachelor of Science degree with a major in Management Science and Computer System from Oklahoma State University, Stillwater, Oklahoma, May, 1984; completed requirements for a Master of Science degree with a major in Human Resources Development, May, 1987.

Professional Experience: Systems Manager, Stillwater Family YMCA, August 1986 to present.

Professional Organizations: Member, Institute of Data Processing Management Association; Affiliate, British Computer Society.