



3-1984

EDP and Accounting: Managing with the Micro Computer

Victoria Sue Mazone

[How does access to this work benefit you? Let us know!](#)

Follow this and additional works at: <https://commons.und.edu/theses>

Recommended Citation

Mazone, Victoria Sue, "EDP and Accounting: Managing with the Micro Computer" (1984). *Theses and Dissertations*. 5582.

<https://commons.und.edu/theses/5582>

This Independent Study is brought to you for free and open access by the Theses, Dissertations, and Senior Projects at UND Scholarly Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of UND Scholarly Commons. For more information, please contact und.common@library.und.edu.

THE UNIVERSITY OF NORTH DAKOTA

EDP and Accounting:
Managing with the Microcomputer

An Independent Study Submitted To The Faculty
of Accounting and Business Law In Partial
Fulfillment For The Degree of Masters of
Accountancy

By
Victoria Sue Mazone
Bachelor's of Science in
Business Administration
Valley City State College

Grand Forks, North Dakota
March 1984



LIST OF ILLUSTRATIONS

Figure	
1.A.	Classes of Users of IBM PC 16
1.B.	Numbers of IBM PCs Within Companies 16
2.	Motel '83 Form. 26
3.	Motel '84 Form. 27
4.	MTL Update Report 28
5.	Card Update Report. 29
6.	MSN Update Report 30
7.	DZ Update Report. 31
8.	Interim Form. 37
9.	Service Desk Report 41
10.	Mail Directory Report 42
11.	Day Update Report 43
12.	Average Occupancy Bar Graph 49
13.	Average Occupancy Line Graph. 50
14.	Application Comparison Bar Graph. 51
15.	Board Plan Distribution Pie Graph 52
16.	Conduct Summary by Type of Incident Bar Graph 54
17.	University Apartments - Fiscal Yr 1982 Family Housing Occupancy By Mn. 59
18.	University Apartments - Fiscal Yr 1982 Single Housing Occupancy By Mn. 60

LIST OF TABLES

1. Academic 80-81.	45
2. Academic 81-82.	46
3. Academic 82-83.	47
4. Linen Survey.	55
5. University Apartment Income Breakdown by Month.	57
6. University Apts - Fiscal Yr 1982, Average Occupancy . . .	58

PREFACE

EDP and Accounting: Managing with a Microcomputer was developed to meet a partial requirement for the degree of Master's of Accountancy from the University of North Dakota.

Its general format is centered around three case studies prepared and performed with the aid of the housing department at the University of North Dakota.

The author was not a part of the on-going work of that department but rather served in the capacity of administrative assistant to the director of the department.

In that position, the author served as a research aid in planning, documenting, implementing and supervising the use of the microcomputer in selected situations. The primary objective was to evaluate the documentation and incorporate the microcomputer's use into the management process.

The materials and information included in these studies are from personal interviews with the director of housing and his staff in Grand Forks, North Dakota, conducted in the fall of 1983.

The material and information included in the appendix is from the files of Fox & Co., and from a personal interview with Gene Blish of Denver, Colorado, in January 1984.

Finally the author wishes to express her appreciation to Terrence Webb, director of Housing at the University of North Dakota and his excellent staff for the opportunity afforded by these studies; and to Fox & Co., P.C. for providing library and office facilities, and to Tim de Bord and Gene Blish, partners in their Denver, Colorado office, for their technical assistance.

CHAPTER I

Introduction

Microcomputers represent the fastest-growing segment in the data processing industry today. There are new product announcements by major computer manufacturers on an almost daily basis. The "state-of-the-art" changes from morning to evening. These machines are finding uses in homes, schools, and businesses.¹

This paper is devoted to a closer look at the microcomputer in business situations and accounting applications. These accounting applications include both financial decision-making applications as well as internal control applications.

"The development of business micro and minicomputer technology, providing inexpensive systems capable of performing a great number of tasks, has led to the inclusion of the computer as standard office equipment, as familiar as the typewriter and the copying machine," writes Lawrence Feidelman.²

The computer can reduce, and often eliminate, the mundane tasks that previously were completed by people. Increased

¹Bill Latham, "How to Select a Personal Computer", Cost and Management (OCTOBER 1982) p. 58.

²Lawrence Feidelman, "Small Business Computers - Which One Is Right For You?", The Office (JULY 1982) p. 84.

information requirements, need for more accurate reports prepared more quickly and recording of rapid changes in figures, have demanded automation. Total cost savings have been of prime consideration.³

The computer's capability to store, manipulate and allow retrieval of data with great rapidity provides business executives with timely information. It is this capability that makes the microcomputer an essential aid in management decision-making. Because of its usefulness, the microcomputer is making its way into a multitude of organizations.⁴

Expenditures for business computing, in general, have expanded dramatically to make use of the available technology. R. Nolan of Harvard Business Review writes, "Although the business-computing expenditures in one manufacturing company increased from \$25 million in 1970 to \$90 million in 1980, the data processing manager, who in 1970 had direct control over all of the \$25 million business-computing expenditures, directly controlled only 60% of the 1980 expenditure."⁵ This highlights one of the problems of building an integrated corporate computer network, that is one of control and planning. With the ever-increasing number of relatively inexpensive small computers, many

³Feidelman, p. 84.

⁴Ibid.

⁵R. Nolan, "Strategic Choice: Information Systems", Harvard Business Review (JULY-AUGUST 1982) p. 73.

accounting managers are beginning to view microcomputers in a new light.⁶

Application of small computers to many small jobs previously done manually offers several advantages over the large computer, i.e.; mainframe, approach. First, because the programs are independent of mainframe applications, there is no need to evaluate the effect of a change on subsystems. Second, development can be done in the department as the tasks are simplified. Third, since development can be performed in the department, new programs, and revisions to old programs can be implemented easily and very quickly. Finally, the small computer approach is more flexible, programming is less complex and change is dictated by each new set of problems to be dealt with.⁷

This paper explores these four advantages both in practical situations at the University of North Dakota and in the current literature. Further a look at the disadvantages of microcomputers may aid in the implementation of a microcomputer system and clarify its ensuing impact on the office situation. Costs of installation and software can give even the smallest client, or company, a view of the investment feasibility of buying a "computer", according to M. Mansfield.

⁶Mark D. Mansfield, "Plugging the DP Gap: Small Computers for Big Business", Management Accounting (SEPTEMBER 1983) p. 58.

⁷Ibid.

With so many businesses purchasing in-house computers, accountants--whether they have the expertise, or need assistance from a computer consultant,--must take the lead in helping their clients, or their company, make the right choice. One of the most important ingredients in the successful purchase of a computer is the liaison role of the accountant. Whatever system is chosen, the accountant has to work with it--and should therefore get involved before the computer selection process even begins. By using certain basic steps, the accountant can ensure that the hardware and software will match those needs identified as closely as possible.⁸

And finally, almost everywhere management information-systems (MIS) executives have recognized the need for coming to grips with the influx of the micro/personal computers. Many were against the whole idea initially. Control, or loss of it, was an early fear. MIS executives were concerned with control over corporate data and the big systems responsibility. This concern has led to more awareness of the role the microcomputer plays in decision-making and analysis and the awareness of the need for better implementation plans and the integrity of the corporate data base.⁹

⁸John A. Wixson, "Five Basic Steps to Computer Acquisition", The Practical Accountant (OCTOBER 1983) p. 72.

⁹J. Lusa, "Buying a Desk-Top Computer? You're on the Road to a Dilemma", Infosystems (DECEMBER 1982) p. 40.

Integration of the micro-based software and work stations is an important concern. Therefore a look at the networking and integration capabilities in the future will not only help in planning and control but remind the profession that this technology was not a flash in the pan but is here to stay.¹⁰

The most prevalent uses of the integration, or the mainframe-to-micro link, are for budget worksheets and account analysis. For example, twelve months of budget history can be downloaded in micro format, factored, extrapolated and reviewed for final adjustments quite easily on the micro.¹¹

One advantage of this link is the savings in time. An accountant may save time by entering data directly in selected format rather than re-keying the data.¹²

Beginning with the very introduction of computers into the business world there has been controversy over how to make them do something useful for business. Computer manufacturers have been searching for a better way to make the power of the computer directly available to end users without having to go through the conventional application development process.¹³ So this

¹⁰Ibid.

¹¹"Micro-Mainframe Links: A Practical Reality?" Management Accounting (MARCH 1984) p. 12.

¹²Ibid.

¹³"End-User Computing: the Information Center and PCs." Management Accounting (FEBRUARY 1984) p. 12.

evolutionary process continues with the technological advances in minicomputers, microcomputers, and super microcomputers. This study is confined to the uses of the microcomputer also referred to as desk-top computer and personal computer.

CHAPTER II

Background: Impact of the Microcomputer

Statement of Financial Accounting Concepts No. 1 Objectives of Financial Reporting by Business Enterprises states that "financial reporting is not an end in itself but is intended to provide information that is useful in making business and economic decisions." These objectives are also affected by the characteristics and limitations of the kind of information that financial reporting can provide.¹³

The objectives state that:

- "Financial reporting should provide information that is useful . . . information should be comprehensible."
- "Financial reporting should provide information about the economic resources of an enterprise . . . financial performance during a period."
- "Management knows more about the enterprise . . . and accordingly can often increase the usefulness of financial information by identifying certain events

¹³Statement of Financial Accounting Concepts No. 1 Objectives of Financial Reporting by Business Enterprises. (NOVEMBER 1978) n.p.

and circumstances and explaining their financial effects on the enterprise."¹⁴

The need for information on which to base investment, credit and similar decisions underlies the objectives of financial reporting. The usefulness of information must be evaluated in relation to the purposes to be served, and the objectives of financial reporting are focused on the use of accounting information in decision making.¹⁵

Relevance and reliability are the two primary qualities that make accounting information useful for decision making. Each user of accounting information will uniquely perceive the relative value to be attached to each quality of that information. The perceived benefits must exceed the perceived costs associated with it. However, it has always been difficult to assess the costs of information. There are costs of using information as well as of providing it; and the benefits from providing financial information accrue to preparers as well as users of that information.¹⁶

The usefulness of accounting information is measured entirely by its actual or potential contribution to the decision-

¹⁴Ibid.

¹⁵Statement of Financial Accounting Concepts No. 2 Qualitative Characteristics of Accounting Information. (MAY 1980) n.p.

¹⁶Ibid.

making process. The tie between the accounting process and the decision-making process is basically one of information. Accounting is a data-providing function which is required at each step of the decision-making process.¹⁷

Management planning and control systems consist of three categories: Strategic planning, management control, and operational control. These categories aid and facilitate decision-making.¹⁸

This author believes the future of the management accounting information system should not be embedded in the traditional financial accounting system. It should be decision-oriented; it should emphasize data base management; and it should consider both technical and behavioral factors.¹⁹

"Information choice is an important problem in organizations. The problem for accountants is what information to supply, while the problem for managers is what information to demand. Presumably, accountants would like to supply information managers demand to solve problems," writes M. Shields.²⁰

¹⁷W. Thomas Lin and William K. Harper, "A Decision-Oriented Management Accounting Information System", Cost and Management (NOVEMBER-DECEMBER 1981) p. 33.

¹⁸Ibid., p. 36.

¹⁹Ibid.

²⁰Michael D. Shields, "Effects of Information Supply and Demand on Judgment Accuracy: Evidence from Corporate Managers", The Accounting Review 58 (APRIL 1983) p. 285.

Further, the effects of this supply and demand on the manager's judgment accuracy are of critical interest to accountants in their efforts to improve an organization's efficiency and effectiveness.²¹

"Prior research in accounting has proposed that measures of the demand for information, or perceived utility of information, be based on how it is used. The assumption underlying this proposal is that experienced managers have learned to select information which is most useful for making judgments and that research could employ measures of how information is used as measures of the demand for information," continues M. Shields.²²

Put another way, the essence of the foregoing framework is that it regards an information system as a source of messages (or signals) which will affect the decision maker's probability assessment of the states of nature. The value of an information system is defined, roughly speaking, as the expected increase in utility by having an information system, compared to not having an information system.²³

A correlation exists between the experienced manager's

²¹Ibid.

²²Ibid., 287.

²³Hiroyuki Itami, "Adaptive Behavior: Management Control and Information Analysis", Studies in Accounting Research #15 American Accounting Association.

demand for information, the supply of information and judgment accuracy.²⁴

To bring the discussion from general to specific, it is essential that accountants understand the procedures and policies of various companies so that the accounting information systems can be related more effectively to filling the information needs they impose.²⁵

The objective of a system that provides management control by information is to present to each responsible manager an accurate, timely representation of the operations performed so that he/she can evaluate past performance, plan future operations, decide changes of direction and, if needed, select new courses of action.²⁶

For the most part, accounting information systems are designed to process data for presentation in the basic financial statement format, i.e., balance sheet, income statement, etc.

R. Peterson and R. Grimlund state:

Automated data-processing equipment and the corresponding power to gather, analyze, and report data are an important part of the [information system]. Most managers in non-profit, profit and government sectors have available some configuration of computer hardware and software ranging from service bureau assistance to

²⁴Shields, p. 288.

²⁵Marvin C. Kelly, "Data Communications Plans - Some Financial Aspects", Selected Papers 1972 Haskins & Sells (FEBRUARY 1972) p. 3.

²⁶Ibid.

more sophisticated on-line applications . . . Accounting tasks, both routine and periodic, are regularly implemented using a wide range of computer technology.²⁷

A significant technological development, that is the microcomputer, is rapidly affecting enterprises of all sizes.²⁸

The AICPA Special Committee on Small and Medium Sized Firms concluded in October 1980 that "the destiny of each firm will be determined by its ability to compete and to adapt to the times."²⁹

Adaption to changing and uncertain environments is probably one of the most important roles for the management of a firm in a dynamic decision context. Adaptive behavior is important at all levels of management. At the top level, a firm must adapt its structure, technology, general policies, etc. to the changing needs and demands of the society and the economy. At the operational level, operating plans have to be adjusted, and revised several times during implementation in order to gear them to changing demands as these demands become known to, or suspected by, the managers.³⁰

²⁷Russell J. Peterson and Richard Grimlund, "CADRAS: Computer Assisted Data Recording and Analysis", Issues in Accounting Education 1983 (1983) p. 146.

²⁸David R. Campbell, "Microcomputers for Small Practitioners", CPA Journal (JUNE 1983) p. 28.

²⁹Ibid.

³⁰Itami, p. 6.

Hiroyuki Itami notes that "Adaption is necessary because most business processes are dynamic in nature; that is, most businesses are going concerns."³¹

What role, then, does the microcomputer play in this dynamic process?

First of all, a microcomputer, or personal computer, is a small computer built around a microprocessor, which is a central processor fabricated on one or two chips. These machines are usually designed for three different markets: home and hobby, general purpose, and professional business.³²

Microcomputers represent the fastest-growing segment in the data processing industry today. There are new product announcements by major computer manufacturers on an almost daily basis.³³

The desktop computer, personal computer or microcomputer has made a successful transition from a hobbyist's toy in 1980 to a manager's tool in two year's time. This metamorphosis was the result of the introduction of usable and dependable microcomputer business/management software (programs). Packaged flexible software provided the computer novice with the capability to

³¹Itami, p. 6.

³²Latham, p. 60.

³³Latham, p. 59.

operate a computer independently for the first time, without pressure from Electronic Data Processing (EDP) managers, systems analysts or programmers. "This development offered the user a quantum leap forward in performing certain management tasks in a highly creative fashion," states Allen Sneider of JPM.³⁴

Rarely does a week go by without the appearance of another article on the "revolution" in the use of microcomputers in business.³⁵

Microcomputers are being brought into the office, not by top management dictum, but by managers who want their own computers. These microcomputers are being used in a wide range of companies to do a variety of tasks, from simple record keeping to financial modeling in which various assumptions and scenarios can be combined and evaluated.³⁶

A microcomputer is defined as one that costs less than \$5,000, is compact, and can be used without specialized knowledge.

Sales and shipments of microcomputer hardware and software display astonishing growth. In 1981, estimates of unit sales of

³⁴Allen Sneider, "Desktop Computers: Extending Management Capabilities", Journal of Property Management (NOVEMBER-DECEMBER 1982) p. 11.

³⁵James R. Freeland, "Can a Personal Computer Really Help You?", Business Horizons (JANUARY-FEBRUARY 1983) p. 56.

³⁶Ibid., p. 57.

hardware ranged from 500,000 to 750,000 units. Hardware dollar sales were around \$1.5 billion, with 80 percent of sales occurring in the professional/business segment. In 1981 software sales were estimated in the \$500 to 600 million range. This market is expected to grow at a better than 50 percent rate over the next five years.³⁷

The IBM PC installation base continues to swell (over 1 million units by 1983 year end), as the momentum for the initial PC (personal computer) accelerates; as IBM continues to add new products, i.e., the XT, 3270-PC and 370 XT; and as more IBM PC independent software and hardware suppliers give potential users more and more reasons to buy. By year end 1984 the base should swell to about 2.5 million units.³⁸ (See Figure 1A & 1B).

The typical microcomputer system consists of several components. The input device is most generally a typewriter keyboard; the output device is generally a monitor, such as a cathode ray tube (CRT) and/or a printer.³⁹

The computer itself is a single integrated circuit microprocessor and several integrated circuits for internal memory, usually referred to as bytes of memory. A byte is simply a unit of computer memory capacity, with one byte holding one

³⁷Freeland, p. 57.

³⁸"IBM PC User Reactions, Requirements & Plans - 1984", Report #1516, IBM (1984).

³⁹Freeland, p. 58.

Figure 1A
Classes of Users

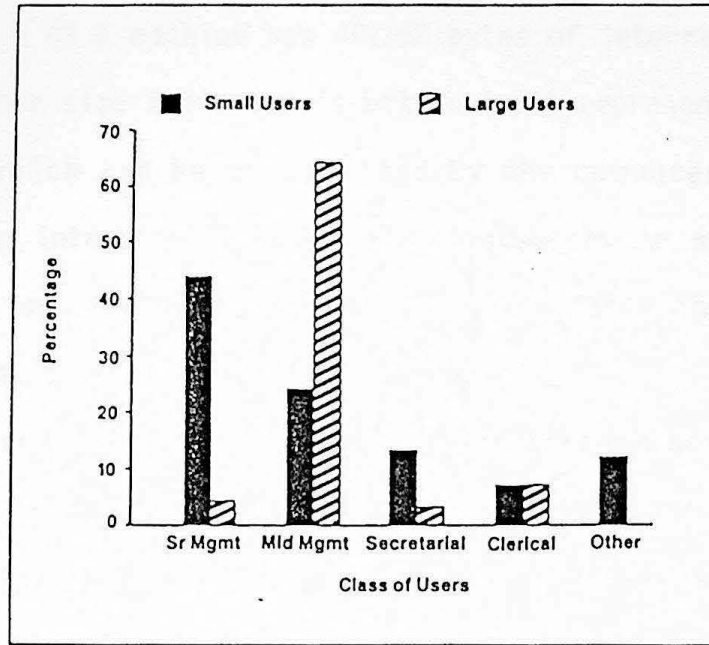
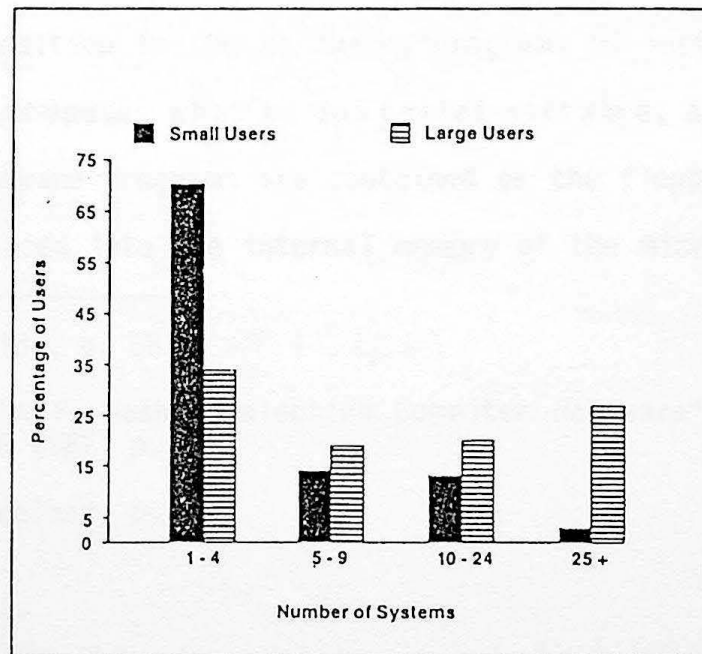


Figure 1B
Number of Systems



letter or number. The measurement of bytes is usually signified by the alpha character K, with K representing 1,024 bytes. Therefore a 48 K machine has 49,152 bytes of internal memory.⁴⁰

Another size indicator is bits. A bit represents the amount of data which can be manipulated by the computer in a single step. The integrated circuit microprocessors in microcomputers are 8-bit or 16-bit microprocessors. Generally the greater the bit length, the more powerful the machine.

External storage is accomplished through devices such as cassette tape recorders, floppy-disk drives, or hard drives. Most microcomputers use one or more floppy-disk drives. A floppy-disk drive is a magnetic oxide-coated mylar disk .005 inches thick and 7.8 or 5.25 inches in diameter. Floppy-disks can store from 85K to 280K bytes of information. A hard disk can expand the size of external memory to several million bytes.⁴²

In addition to the hardware, programs of instructions that tell the computer what to do; called software, are available. These software programs are contained on the floppy disks which can be placed into the internal memory of the microcomputer via

⁴⁰Ibid., p. 58.

⁴¹John F. Nash, "Selecting Computer Hardware", CPA Journal (SEPTEMBER 1982) p. 57.

⁴²Freeland, p. 57.

the disk drive.⁴³

At the University of North Dakota housing office, an IBM PC double density, dual drives with 320 K of internal memory is being used. The input device, or keyboard, is part of the computer and an Amdek color monitor serves as the output device along with an EPSON FX-100 dot matrix 132 column printer. The software, used in the case studies consisted of DOS 1.1, a floppy disk which contains the operating system; LOTUS 1-2-3, a package of three floppy-disks containing a system disk, a graphics disk and a utility disk; PFS FILE and PFS REPORT, two separate but related program disks designed to file information in desired format and to retrieve and prepare reports based on preference.⁴⁴

The operating system is a series of control programs that helps make your hardware into an operational system. The operating system performs file management and supports the processor's programming language.⁴⁵ How this hardware and software was used will be explored in Chapter III.

⁴³John F. Nash and Vincent J. Giovinazzo, "Selecting Accounting Software Packages", CPA Journal (OCTOBER 1982) p. 45.

⁴⁴Terrence Webb, interview held during case study, Grand Forks, North Dakota, (OCTOBER 1983).

⁴⁵Latham, p. 60.

CHAPTER III

Management Challenges in the 80's

"Most likely, the college and university housing administrator [director] of the 1980s finds himself or herself involved in institutional planning and budgeting as well as in enrollment enhancement and retention efforts," writes A. Pappas.⁴⁶

Pragmatically speaking, university - and college-owned housing represents a sizeable portion of total university and college real estate in terms of both land and the actual physical plant itself. In most cases, its debt service is a sizeable portion of the institution's total debt service.⁴⁷

Housing is the only unit on campus that operates in a service delivery mode 24 hours a day and that is basically held responsible for the quality of life of students outside the classroom. As a result of this 24-hour exposure, the quality of services and programs offered are up for scrutiny by a host of internal, as well as external, critics, such as the governing board, the alumni, the legislature, the governor, and donors.⁴⁸

⁴⁶Alceste T. Pappas, "Management Challenges of the 1980s", The Journal of College and University Student Housing 13 (SUMMER 1983) p. 3.

⁴⁷Ibid., p. 4.

⁴⁸Ibid.

Unlike most services provided on campus, which rely mainly on funds from sources external to the campus, such as federal or state revenues or corporate, foundation, or individual gifts, housing has traditionally relied on its users, the student residents, to pay their share of the costs associated with living in university housing.⁴⁹

In these days of declining or at best constant income levels, most universities have suffered an excess of expenditures over revenues. Institutions in both the public and private sectors have begun to realize that tuition dependency is extremely fragile in times such as these. As a result, institutions have gone out of their way to focus on the roles of student recruitment and student retention.⁵⁰

Further, the issue of enrollment mix plays a significant role in this "positioning" in the market place. The number of part-time students is on the increase. Some campuses report that the average age of their undergraduates is between 26 and 28. Still others report increases in working-student families and single parents. This shift in the enrollment mix and in many cases the actual decline in numbers of matriculated students has meant that housing officers across the country have been influenced in their service delivery efforts.

⁴⁹Ibid., p. 5.

⁵⁰Ibid.

These same housing officers are feeling the "pinch" from their own vice-presidents and/or chief executive officers who are expecting such auxiliary enterprises as housing to pay "the full load" of their respective costs.⁵¹

The following three cases are an example of how the University of North Dakota is coping with these pressures. The objectives of more efficient information processing and timely decision-making were apparent to this author. Although the case studies were hampered by lack of relevant accounting data in certain situations, a comparison of old and new methods used in the housing department, will be made.

⁵¹Ibid.

CASE STUDY ONE

This independent study is a presentation of three case studies prepared and performed under the general guidance and direction of the director of housing at the University of North Dakota.

The University has thirteen residence halls and one of the largest apartment operations in the nation. The residence halls house approximately 3000 students per semester and the apartment operation houses an average of 857 students per month in single and family dwellings.

The director of housing Terrence J. Webb, his associate director Derrald Dewald and the entire staff shared not only their experience and expertise but their support in these case studies as well.

Case number one called "Motel 83", involved a problem not unique to the University. In August of every year the University experiences a shortage of available space and a waiting list of students seeking housing. This list has grown steadily from approximately 210 students in 1982 to over 400 in 1983. The demand exceeds the supply.

The procedure for processing these students on the waiting list is based in theory on a contingent event.

There is a certain percent of students who cancel their housing reservations within the first two weeks of class and students who are classified as "no shows". The housing department maintains a waiting list in August for the first week of classes in the Fall semester. Each day the list is updated as students are placed in the halls as vacancies occur. After the first week period is over the waiting list is no longer maintained and all vacancies are filled on a first-come first-served basis for the remainder of the semester. For the one week holding period the housing department provides temporary housing in local motels.

Historically, the waiting list has contained more men than women and the department has always been able to place all of the women. However the steady increase in men applying for housing is predominately freshmen and the University lacks the space for these students.

The thirteen residence halls are divided among three complexes and have the following population patterns:

<u>Johnstone-Fulton Complex</u>	<u>Type of Occupancy</u>	<u>Normal Capacity</u>
East Hall	male	43
Johnstone Hall	female	127
Fulton Hall	female	178
Smith Hall	male	240

<u>Walsh Complex</u>	<u>Type of Occupancy</u>	<u>Normal Capacity</u>
Walsh Hall	male	365
Squires Hall	female	232
Bek Hall	female	169
Hancock Hall	coeducational	78
<u>Wilkerson Complex</u>		
McVey	coeducational	272
Brannon	coeducational	303
Selke	female	305
Noren (formerly Gillette)	female	305
West	male	285

Of the three coeducational halls, all have certain criteria to be eligible to live in those halls. Normally a freshman cannot stay in these halls. Of the four remaining all-male halls, there are approximately 933 rooms available.

The six all-female halls house approximately 1316 women. The imbalance in numbers has been a major problem for the housing department for several years.

In 1982 a committee was formed to research the problem and submit recommendations to correct the annual problem of housing freshmen male students each fall.

A proposal to convert one hall to coeducational and one other hall to all male was submitted, however the student

population rejected the plan and the administration took the matter under advisement.

Therefore in Fall of 1983, Terry Webb found the department facing its largest demand yet for housing.

Arrangements were made with the Road-King Motel and a hold was placed on 100 rooms each day from August 26, 1983 through September 2, 1983. The University guaranteed these rooms regardless of occupancy.

On August 26, 1983, 110 students signed up for housing in the motel compared to 53 students the year before. The procedure involved issuing a card for each night's stay. The students had to pay \$3.00 a night for their own stay in the motel and the university paid the remaining balance. The students also had to pick up a card each day for each night's stay.

The microcomputer was used to handle the issuing of cards, the serial number and actual count of cards issued. The criteria for being eligible to stay in the motel was to be a registered student who had applied for housing, and had paid a reservation fee. The waiting list was verified each day for possible placements in the hall.

The following form shows a sample of the file card used for the Motel 83 program. A revised form is shown for the Motel 84 program. The software PFS:File and PFS:Report were used for implementation. Samples of brief reports follow the form. (See Figure 2 through 7.)

NAME:		DATE:	TIME:
NAID # :	PRIORITY # :	OVERFLOW:	
TOTAL NIGHTS:			
CARD # /AUG.26:	CARD # /AUG.27:	CARD # /AUG.28:	
CARD # /AUG.29:	CARD # /AUG.30:	CARD # /AUG.31:	
CARD # /SEPT.1:	CARD # /SEPT.2:		
YEAR IN SCHOOL:	AGE:	HOME STATE:	
ASSIGNED:	OFF CAMPUS:	NOT ENROLLED:	GREEK UNIT:
COMMENTS:			

Figure 2.
 Motel '83 Form

NAME:	AGE:	DATE:	TIME:
NAID#:	PRIORITY#:	YEAR IN SCHOOL:	
HOME STATE:		INTENT FORM RECD:	
CARD#/ AUG 24:	CARD#/ AUG 25:	CARD#/ AUG 26:	
CARD#/ AUG 27:	CARD#/ AUG 28:	CARD#/ AUG 29:	
CARD#/ AUG 30:	CARD#/ AUG 31:	OVERFLOW CARD #:	
ASSIGNED:	OFF CAMPUS:	NOT ENROLLED:	GREEK UNIT:
COMMENTS:			

Figure 3.
Motel '84 Form

Figure 4.
MTL Update Report

MTL:UPDATE

NAME	CARD # /SEPT..
BAKER, RICHARD	0781
BLOSS, CLIFFORD	0774
CARLSON, COLLIN	0778
CHA, JIWOOD	0765
COLPITTS, KERRY	0771
DOBBERTHIEN, ROBERT	0772
EBERTZ, MICHAEL	0758
EBERTZ, PATRICK	0759
EVANS, WAYNE	0780
FAHLSTRON, BRIAN	0755
FLYNN, JEFFRY	0756
FOGOLIN, ROBERT	0773
FORBORD, RORY	0777
GANSKOP, WAYNE	0764
GEORGE, TOM	0776
HAGUE, MARK	0757
HARTER, CHARLES	0769
HERICH, CHRISTIAN	0770
INDERMILL, JOHN R	CANCEL
JOHNSON, DOUG	0766
LINDE, TODD	0752
MACRAE, DAVID	0783
OLDS, SCOTT	0749
OLSON, CHRIS	0763
PETERSON, BRAD	0750
PRASKA, ROD	0779
ROSS, JEFFREY	0746
SANDERS, THOMAS	0751
SCHATZ, DONALD	0775
SCHAUB, CHARLES	0767
STAUFFER, DAVID	0748
SWANN, MICHAEL	0762
TENBY, HENRY	0754
THELEN, MIKE	0747
UTTAMSINGH, PRAKASH	0753
VEIGEL, SCOTT	0761
WAGNER, BARRY	0768

Count : 37

37

Figure 5.
Card Update Report

CARD:UPDATE

CARD # /SEPT.	NAME
0746	ROSS, JEFFREY
0747	THELEN, MIKE
0748	STAUFFER, DAVID
0749	OLDS, SCOTT
0750	PETERSON, BRAD
0751	SANDERS, THOMAS
0752	LINDE, TODD
0753	UTTAMSINGH, PRAKASH
0754	TENBY, HENRY
0755	FAHLSTRON, BRIAN
0756	FLYNN, JEFFRY
0757	HAGUE, MARK
0758	EBERTZ, MICHAEL
0759	EBERTZ, PATRICK
0761	VEIGEL, SCOTT
0762	SWANN, MICHAEL
0763	OLSON, CHRIS
0764	GANSKOP, WAYNE
0765	CHA, JIWOOD
0766	JOHNSON, DOUG
0767	SCHAUB, CHARLES
0768	WAGNER, BARRY
0769	HARTER, CHARLES
0770	HERICH, CHRISTIAN
0771	COLPITTS, KERRY
0772	DOBBERTHIEN, ROBERT
0773	FOGOLIN, ROBERT
0774	BLOSS, CLIFFORD
0775	SCHATZ, DONALD
0776	GEORGE, TOM
0777	FORBORD, RORY
0778	CARLSON, COLLIN
0779	PRASKA, ROD
0780	EVANS, WAYNE
0781	BAKER, RICHARD
0783	MACRAE, DAVID
CANCEL	INDERMILL, JOHN R

Count : 37

37

Figure 6.
MSN Update Report

MSN:UPDATE

NAME	OFF CAMPUS
BLOSS, CLIFFORD	MSN
BROOKS, MIKE	MSN
CARLSON, COLLIN	MSN
DOBBERTHIEN, ROBERT	MSN
FLYNN, JEFFRY	MSN
FORBORD, RORY	MSN
GEORGE, TOM	MSN
HARLOW, KEVIN	MSN
HARTER, CHARLES	MSN
HERICH, CHRISTIAN	MSN
JOHNSON, DOUG	MSN
NELSON, TYLER	MSN
PEIRCE, TIMOTHY	MSN
PETERSON, DANNY	MSN
SAMSON, THOMAS	MSN
SCHAUB, CHARLES	MSN
SWANN, MICHAEL	MSN
VEIGEL, SCOTT	MSN
WAGNER, BARRY	MSN

Count :	19	19
---------	----	----

Figure 7.
DZ Update Report

DZ:UPDATE

NAME	GREEK UNIT
BAKER, RICHARD	DZ
CHA, JIWOOD	DZ
CHELL, LUTHER	DZ
COLPITTS, KERRY	DZ
EBERTZ, MICHAEL	DZ
EBERTZ, PATRICK	DZ
EVANS, WAYNE	DZ
FAHLSTRON, BRIAN	DZ
FOGOLIN, ROBERT	DZ
GACKLE, MARK	DZ
GANSKOP, WAYNE	DZ
HAGUE, MARK	DZ
LAMPHERE, THOMAS	DZ
LEETUN, ROBERT	DZ
LINDE, TODD	DZ
OLDS, SCOTT	DZ
OLSON, MARK	DZ
OLSON, CHRIS	DZ
PAGE, DANIEL	DZ
FEDERSEN, BRIAN	DZ
PETERSON, BRAD	DZ
PRASKA, ROD	DZ
ROSS, JEFFREY	DZ
SANDERS, THOMAS	DZ
SCHATZ, DONALD	DZ
SCHMIESS, TIM	DZ
STAUFFER, DAVID	DZ
TENBY, HENRY	DZ
THELEN, MIKE	DZ
UTTAMSINGH, PRAKASH	DZ
WHITE, KEVIN	DZ

Count:

31

31

PFS:File enables a user to design a form that is either one or two pages long. The form is considered to be comparable to an index card. The organization of the data on the form is critical to the interface between the PFS:File program and PFS:Report program.

The reporting capabilities of the PFS:Report demonstrate the power of the microcomputer in management situations.

Every evening a report was submitted to the motel as well as a control copy for the director's use. The report gave the date, name, and card number of each student who was staying in the motel for that evening. The number of students each night varied from 89 to 110.

PFS:Report enables a user to design a report that will include any or all of the fields contained on the PFS:File data base. This software allows any report format desired and will add, count, total, derive columns and perform other tasks too numerous to cover. The documentation or manuals for both software packages were adequate and easy to follow.

One feature of the PFS:File and PFS:Report software is the capacity to use an internal clock feature through the use of the IBM PC function keys F5 and F6. The internal clock is an added feature wired to one of the circuit boards in the computer. This "Monte Carlo" board eliminates the need to enter time and date every time a user logs on. The entry on the form can be

accomplished by the function keys without typist-keyboard entry with every form used.

The actual operation of these programs does require unloading the file program disk and loading the report program disk in order to prepare a report, however this does not create a hardship.

On the final day of this Motel program, it becomes very important to have tight controls established. On that day all of the students who are on the waiting list and file an intent form stating they still want a room, are given all of the vacant rooms on campus. This placement is accomplished by using each student's priority number, in turn, to give out the room assignment.

Because the housing office used the microcomputer for this list of priority numbers (see Figure 2) they were able to keep track of 210 students by cross referencing the waiting list with the motel list and finding the students who had filed an intent form the last day of temporary housing.

All students not placed in the halls on September 1, 1983 were essentially on their own. Although the waiting list had grown to over 400 students only 210 of those students filed the required intent form. Many find housing in the private sector, find apartments to share, pledge greek units, or go home. Of the 210 students, 162 were assigned to the halls, 28 found apartments, or other area living arrangements and the remaining

20 students have not contacted housing subsequent to September 1, 1983.⁵²

⁵²Webb, Interview

CASE STUDY TWO

Case number two, called "Interim 83", was designed to help aid the housing complex directors and head residents in assigning rooms to students who do not go home for the holidays. The interim period under consideration was from December 21, 1983 to January 9, 1984.

Every year the housing department maintains the facilities during periods when school is not in session. Approximately six percent of the students who live in the residence halls, apply during each interim period to be housed. Sometimes they are assigned to their own rooms and sometimes not. The reason for this is because of staffing and demand. If ten or more students in each hall apply and the head resident will be in those halls, then a student may stay in that hall. If not the students are placed in another hall. This requires a vacancy in the receiving hall because no student is placed in another student's room. Therefore the placement requires coordination of current vacancies, days required, and halls that are open. In December 1983, by the use of the reports performed by the software PFS:Report, the complex directors were able to decide 48 hours after the application deadline which halls were to be opened.

The variables that make this decision not as simple as it sounds are students who sign up for three days, one day in

January, two in December not sequential, or the student who is coming back to school a few days early, or decides to leave school a few days late, or the hockey team has a special game and practice in the middle of the interim break, or the basketball team has to come back four days early, etc.

When dealing with individuals, whether students, colleagues or senior citizens, there are many different unique situations. Therefore projections based on the demand for interim assignments becomes a major task.

The form designed to run the "Interim 83" program was prepared using the same software as used in "Motel 83". PFS:File and PFS:Report again displayed its power as a management tool. (See Figure 8).

The need for reports on a daily basis was uppermost in the director's objectives. The service desk, that would be open during interim, had to have an updated list of the current residents and what hall they were in and then the corresponding telephone numbers. Prior to this, the staff on duty at the service desk prepared written lists each day for their own use from the information contained on the application form.

The application form is a five part form. The housing office, complex secretary, service desk, head resident and student each got copies. The service desk kept their copy in a notebook binder. With the use of the microcomputer, the need for hand written list was eliminated.

NAME: NAID #: SEX: DATE: TIME:
UND MAILING ADDRESS:

FIRST HALL ASSIGNMENT: ROOM: PHONE: TOTAL NGTS:
SECOND HALL ASSIGNMENT: ROOM: PHONE: TOTAL NGTS:

IF APPLICABLE GREEN CARD #: GREEN CARD NIGHTS :
NUMBER OF NIGHTS TO BE BILLED:
TOTAL AMT TO BE BILLED (NO OF NGTS X 3.00):
KEYS NUMBERS ISSUED:

NIGHTS STAY - DEC 21:	DEC 22:	DEC 23:	DEC 24:	DEC 25:
DEC 26:	DEC 27:	DEC 28:	DEC 29:	DEC 30:
DEC 31:				
NIGHTS STAY - JAN 1:	JAN 2:	JAN 3:	JAN 4:	JAN 5:
JAN 6:	JAN 7:	JAN 8:	JAN 9:	

COMMENTS:

File: INTERIM

RETRIEVE SPEC

Page 1

Figure 8.
Interim Form

Further, the main mail room had insisted on a list of each resident who had been moved to another room in order to forward the mail. This was prepared by hand by the service desk workers. This need was met with a report generated by the software in a matter of minutes.

The form design was based on the actual application because this author would not be involved in the actual work with the microcomputer due to the time of operation. Therefore the complex secretary would be typing the data in from the application.

Because some students are assigned to several rooms, the form was needed to provide for that occurrence. Further, some students are required to stay on campus during semester breaks and respective departments on campus are billed for these students.

These students are issued a green card and present it to housing at time of application. Therefore the form needed to provide a means of sorting out the paying students from non-paying students and to further supply a breakdown by department for the non-paying students.

For the first time the housing department could assess the green card charges within a matter of minutes. Also because the information had never been contained in such a readily accessible form, these figures were never pursued in the past.

Keeping track of keys issued has always been a serious problem. The key cores on all outside doors are changed with every break in school attendance and in order to gain entry whether in the students own hall or to another hall different keys are required. Also during regular school session the halls are unlocked during the day; however, during interim all halls are locked 24 hours a day. The microcomputer automated the listing of keys issued and to whom for greater key control. Previously this was a hand written manual list prepared by service desk workers and control was minimal. This list provided the direct control over keys required when the keys were lost or had to be turned in. A charge was made for all lost keys.

A total of 193 students signed up for interim housing in December 1983. A total of five halls were open for these students. If this required any student to be placed in another hall, the other hall had to have a vacancy.

The following reports show a sample of the listing prepared for service desk workers (Figure 9) and the listing prepared for the main mail room (Figure 10). Both are prepared by alphabetic order. The third report shows a daily update for whatever day requested, prepared by hall order (Figure 11). In this report we find that PFS:Report will sort based on two columns, the hall being first order of sort, the room number in each hall being the

second order of sort. A count feature was added to each report for more internal control.⁵³

⁵³Derrald Dewald, Interview Held During Case Work, Grand Forks, (DECEMBER 1983)

DIRECTORY

NAME	FIRST HALL ASSIGNMENT	ROOM	PHONE	DEC 24
BALDRICA, NANCY	GILLETTE	3A	3667	X
DEMARCE, MYRNA	WALSH	119C	3190	X
HENKE, KEVIN	GILLETTE	214B	2701	X
JOHNSON, CHARLES	WALSH	18B	2983	X
KONKEL, DENNIS	GILLETTE	5A	2162	X
OACHS, SCOTT	GILLETTE	215A	2761	X
QUAMME, STEVEN	WALSH	110C	2119	X
SANDSRUD, GRACE	GILLETTE	114A	2524	X
TANG, TATT	HANCOCK	319	3387	X

Count: 9

Figure 9.
Service Desk Report

MAIL DIRECTORY

NAME	FIRST HALL ASSIGNMENT	ROOM	PHONE
ANDERSON, DAWN	WALSH	312A	3283
BALDRICA, NANCY	GILLETTE	3A	3667
CRABILL, JAMES	WALSH	14B	2889
DEMARCE, MYRNA	WALSH	119C	3190
EIDENSCHINK, JUDY	GILLETTE	314A	3279
FARRELL, WILLARD	GILLETTE	315B	3751
GOEPLICH, GEORGE	WALSH	121A	2180
HENKE, KEVIN	GILLETTE	214B	2701
ICEMAN, ARLENE	GILLETTE	313B	3211
JOHNSON, CHARLES	WALSH	18B	2983
KONKEL, DENNIS	GILLETTE	5A	2162
LEBEAU, DONNA	GILLETTE	304A	2902
MAZONE, VICTORIA	BEK	222A	5432
MESTETH, YVONNE	GILLETTE	304B	2902
NYQUIST, RICHARD	GILLETTE	3A	2111
OACHS, SCOTT	GILLETTE	215A	2761
PUTNAM, CONTENT	GILLETTE	312A	3212
QUAMME, STEVEN	WALSH	110C	2119
RAVE, TIFFANY	GILLETTE	312A	3212
SANDSRUD, GRACE	GILLETTE	114A	2524
TANG, TATT	HANCOCK	319	3387
Count:	21	21	21

Mail Directory Report
Figure 10.

DAY UPDATE

HALL	ROOM	NAME	DEC 21	DEC 22	DEC 23	DEC 24	DEC 25	
BEK GILLETTE	222A	MAZONE, VICTORIA	X	X				
	003A	NYQUIST, RICHARD	X	X				
		BALDRICA, NANCY	X	X	X	X		
	005A	KONKEL, DENNIS	X	X	X	X	X	
	114A	SANDSRUD, GRACE	X	X	X	X	X	
	214B	HENKE, KEVIN	X	X	X	X	X	
	215A	OACHS, SCOTT	X	X	X	X	X	
	304A	LEBEAU, DONNA	X					
	304B	MESTETH, YVONNE						
	312A	RAVE, TIFFANY	X					
		PUTNAM, CONTENT	X					
	313B	ICEMAN, ARLENE	X					
	314A	EIDENSCHINK, JUDY						
	315B	FARRELL, WILLARD	X					
HANCOCK WALSH	319	TANG, TATT	X	X	X	X	X	
	014B	CRABILL, JAMES	X	X				
	018B	JOHNSON, CHARLES	X	X	X	X	X	
	110C	QUAMME, STEVEN	X	X	X	X	X	
	119C	DEMARCE, MYRNA	X	X	X	X	X	
	121A	GOEPLICH, GEORGE	X	X				
	312A	ANDERSON, DAWN						
Count:			21	18	13	9	9	8

Figure 11.
Day Update Report

CASE STUDY THREE

The final case number three called "Annual Report 1982-1983" required a miscellaneous collection of summaries, tables, graphs and charts.

The director prepares an annual report for the president of the University and for the first time the microcomputer was available to aid in that preparation.

The author was not involved in the preparation or presentation of the annual report, but rather in the mechanics of preparing the tables and graphs.

The case study involved hands-on experience with the IBM PC, Epson printer and the Lotus 1-2-3 software package. This software is an integrated, sophisticated, electronic spreadsheet with capacity for 256 columns and 2048 rows. This spreadsheet would cover approximately 21 feet in length if done by hand. The largest record placed on this spreadsheet required 50 columns and 628 rows.

The first three tables (Table 1-3) shows the average occupancy figures for 1980-1981, 1981-1982, 1982-1983, by months according to each hall. A figure of average occupancy for each month is shown and average occupancy for year by each hall. The bottom line shows a percent of occupancy for each month based on

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Average Occupancy	Normal Capacity
Academic 80-81												
Bek	232	209	198	194	194	170	168	167	166	166	186.4	165
Brannon	303	299	300	300	300	283	280	279	278	278	290	306
East	42	43	43	43	43	42	43	43	42	42	42.6	42
Fulton	183	176	171	172	172	161	157	155	155	155	165.7	178
Gillette	304	303	302	302	301	287	287	287	286	286	294.5	305
Hancock	73	73	74	74	74	76	75	75	75	75	74.4	78
Johnstone	128	121	122	122	121	112	112	111	111	111	117.1	125
Mcvey	283	276	272	270	269	254	252	249	249	249	262.3	272
Selke	304	301	301	301	299	275	271	269	268	268	285.7	305
Smith	249	250	248	248	249	244	241	241	242	242	245.4	240
Squires	235	231	231	232	232	223	225	226	226	226	228.7	232
Walsh	416	392	385	383	386	396	388	385	382	381	389.4	365
West	284	282	283	284	282	280	274	267	266	266	276.8	285
Ave Occupancy For Month	3036	2956	2930	2925	2922	2803	2773	2754	2746	2745		2898
% Of Occupancy For Month	104.76%	102.00%	101.10%	100.93%	100.83%	96.72%	95.69%	95.03%	94.76%	94.72%		

Table 1.
Academic 80-81

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Average Occupancy	Normal Capacity
Academic 81-82												
Bek	223	215	203	196	195	160	157	157	157	158	182.1	165
Branson	278	293	289	286	285	286	278	274	274	273	281.6	306
East	41	43	43	42	42	43	42	43	43	43	42.5	42
Fulton	175	174	170	170	169	157	157	158	159	159	164.8	178
Gillette	286	290	294	295	295	276	276	275	274	274	283.5	305
Hancock	70	73	76	73	73	76	75	74	74	72	73.6	78
Johnstone	133	128	123	121	121	109	109	110	110	110	117.4	125
Mcvey	263	279	274	271	270	260	255	252	251	251	262.6	272
Selke	299	301	301	302	301	268	265	261	260	261	281.9	305
Smith	248	248	248	246	244	237	237	237	236	236	241.7	240
Squires	230	230	228	227	227	225	224	224	223	223	226.1	232
Walsh	396	411	401	394	392	374	366	361	360	359	381.4	365
West	273	279	280	283	283	280	277	276	277	276	278.4	285
Ave Occupancy For Month	2915	2964	2930	2906	2897	2751	2718	2702	2698	2695		2898
% Of Occupancy For Month	100.59%	102.28%	101.10%	100.28%	99.97%	94.93%	93.79%	93.24%	93.10%	93.00%		

Table 2.
Academic 81-82

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Average Occupancy	Normal Capacity
Academic 82-83												
Bek	221	206	194	193	193	162	162	162	161	160	181.4	165
Brannon	263	275	278	277	277	285	283	282	281	282	278.3	306
East	40	42	42	42	42	43	44	44	44	44	42.7	42
Fulton	170	168	167	165	166	157	156	156	156	156	161.7	178
Gillette	297	290	283	288	288	275	271	271	271	271	280.5	305
Hancock	72	73	77	78	78	74	75	76	75	74	75.2	78
Johnstone	122	114	112	112	112	107	109	109	108	108	111.3	125
Mcvey	274	274	276	276	275	262	259	258	256	256	266.6	272
Selke	301	294	296	297	297	273	268	269	267	267	282.9	305
Smith	245	249	250	250	250	248	245	246	244	242	246.9	240
Squires	228	221	223	223	223	213	217	217	216	214	219.5	232
Walsh	413	412	407	405	406	399	394	392	388	386	400.2	365
West	281	281	283	284	284	280	276	275	276	275	279.5	285
Ave Occupancy For Month	2927	2899	2888	2890	2891	2778	2759	2757	2743	2735		2898
% Of Occupancy For Month	101.00%	100.03%	99.65%	99.72%	99.76%	95.86%	95.20%	95.13%	94.65%	94.38%		

Table 3.
Academic 82-83

the normal capacity figure. Normal capacity is a net figure determined by the director.

The following graphs, bar and line graphs (Figures 12 & 13) display these same tables graphically. The increase in August is apparent as well as the decrease towards the end of the academic year. This trend is much more obvious in the graphic presentation than in the tabular presentation.

Figure 14 shows a comparison of the number of applications for housing by months over the years 1980-1983. The previous years are shown for comparative purposes. Data was not available for March 1980 to August 1980.

Figure 15 shows the board plan distribution for the week of September 24, 1983. The University offers three board plans to all residents and provides board releases on an individual basis if the need exists. These figures were provided to the director by the food services supervisor. This chart represents the only pie chart presented in the annual report. The pie chart does not lend itself easily to comparisons or to expanded titles or legends. Therefore its usefulness to housing was minimal.

Figure 16 shows a conduct summary by type of incident for year 1982-1983. Each month the head residents submit a report of all conduct conferences and incidences in their hall. This graph shows the numbers of incidents during the academic year by type of incident. It demonstrates the feature of Lotus 1-2-3; that is

Figure 12.
Average Occupancy Bar Graph

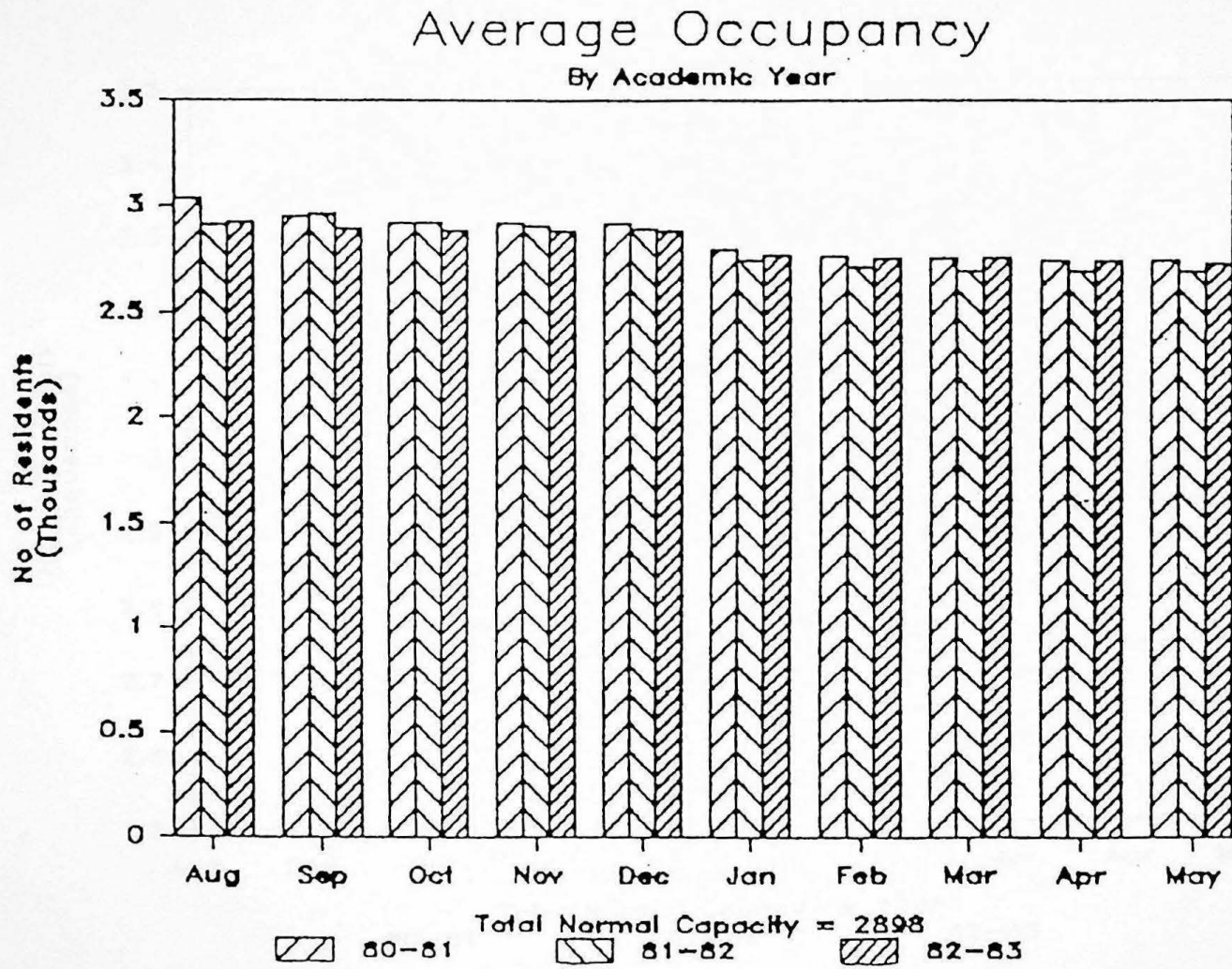


Figure 13.
Average Occupancy Line Graph

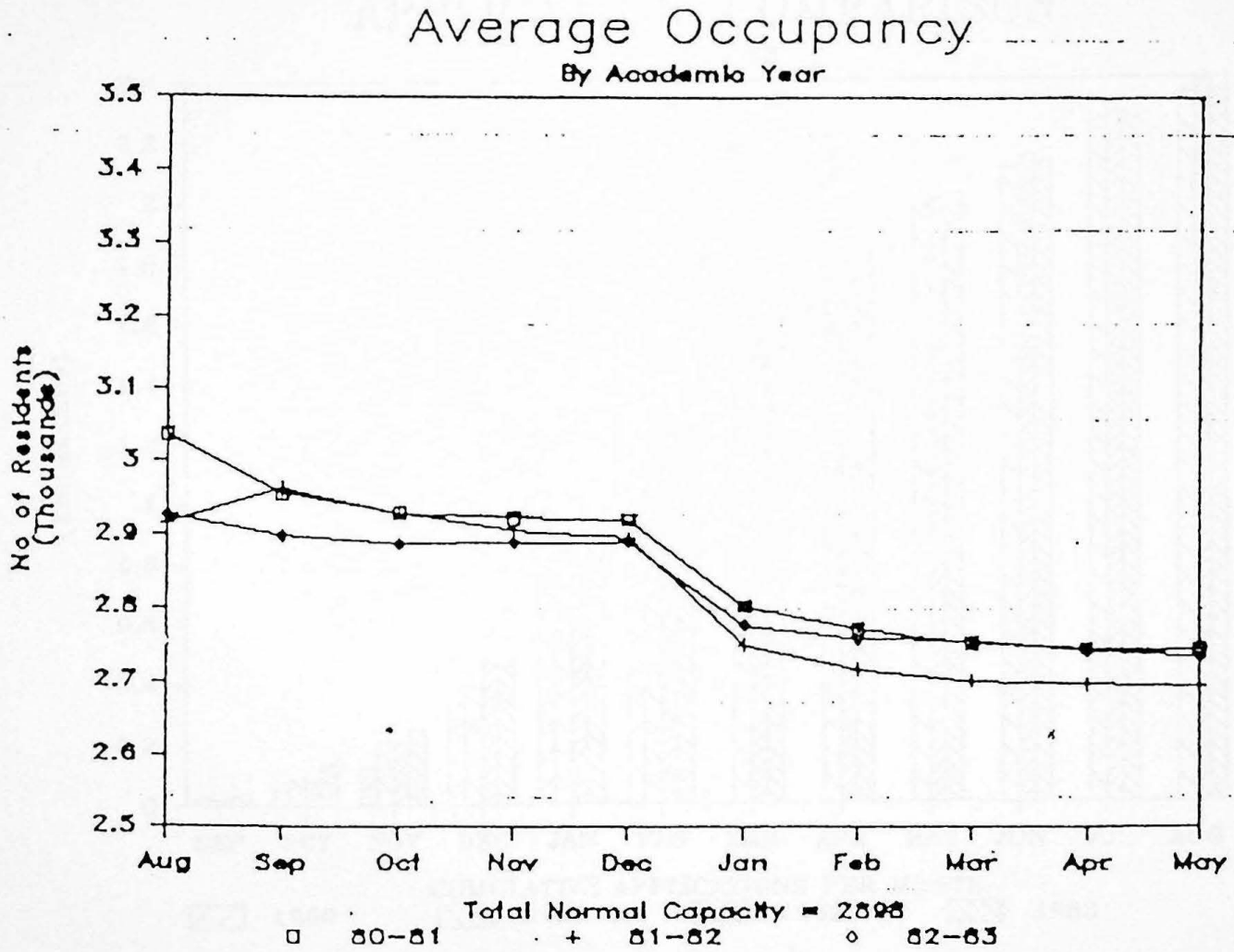


Figure 14.
Application Comparison Bar Graph

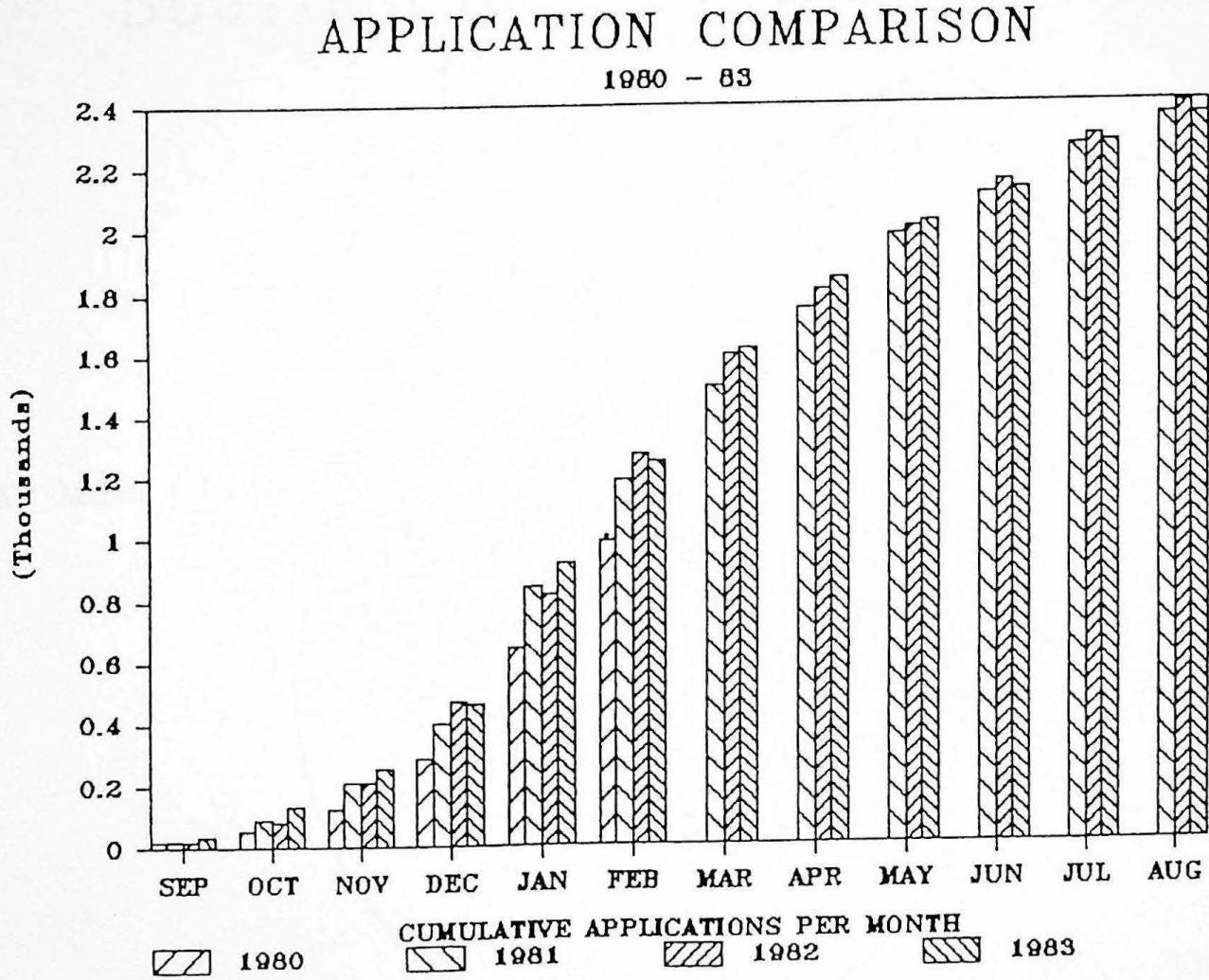
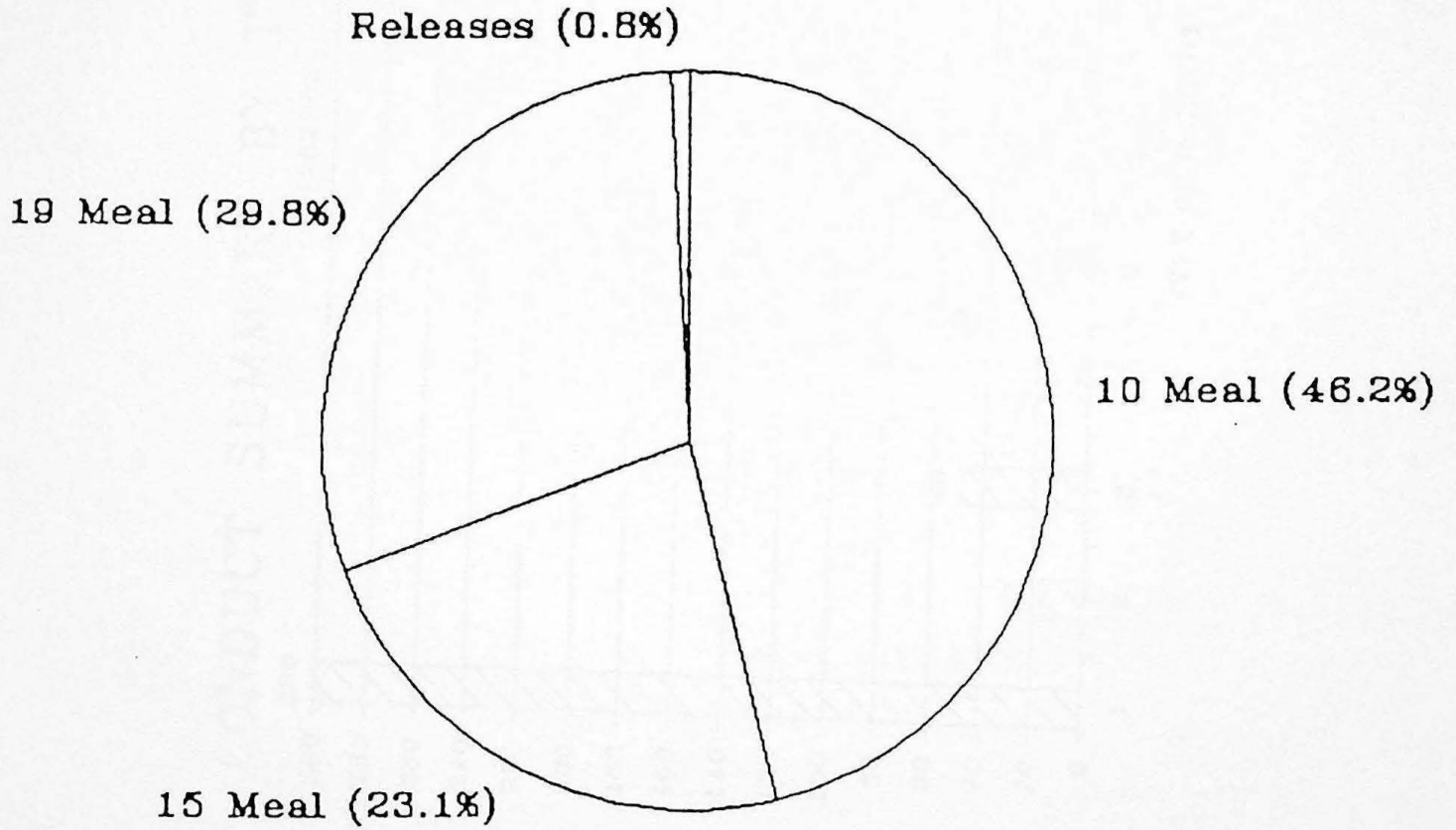


Figure 15.
Board Plan Distribution Pie Graph

Board Plan Distribution

For Sept. 24, 1983



CONDUCT SUMMARY BY TYPE OF INCIDENT

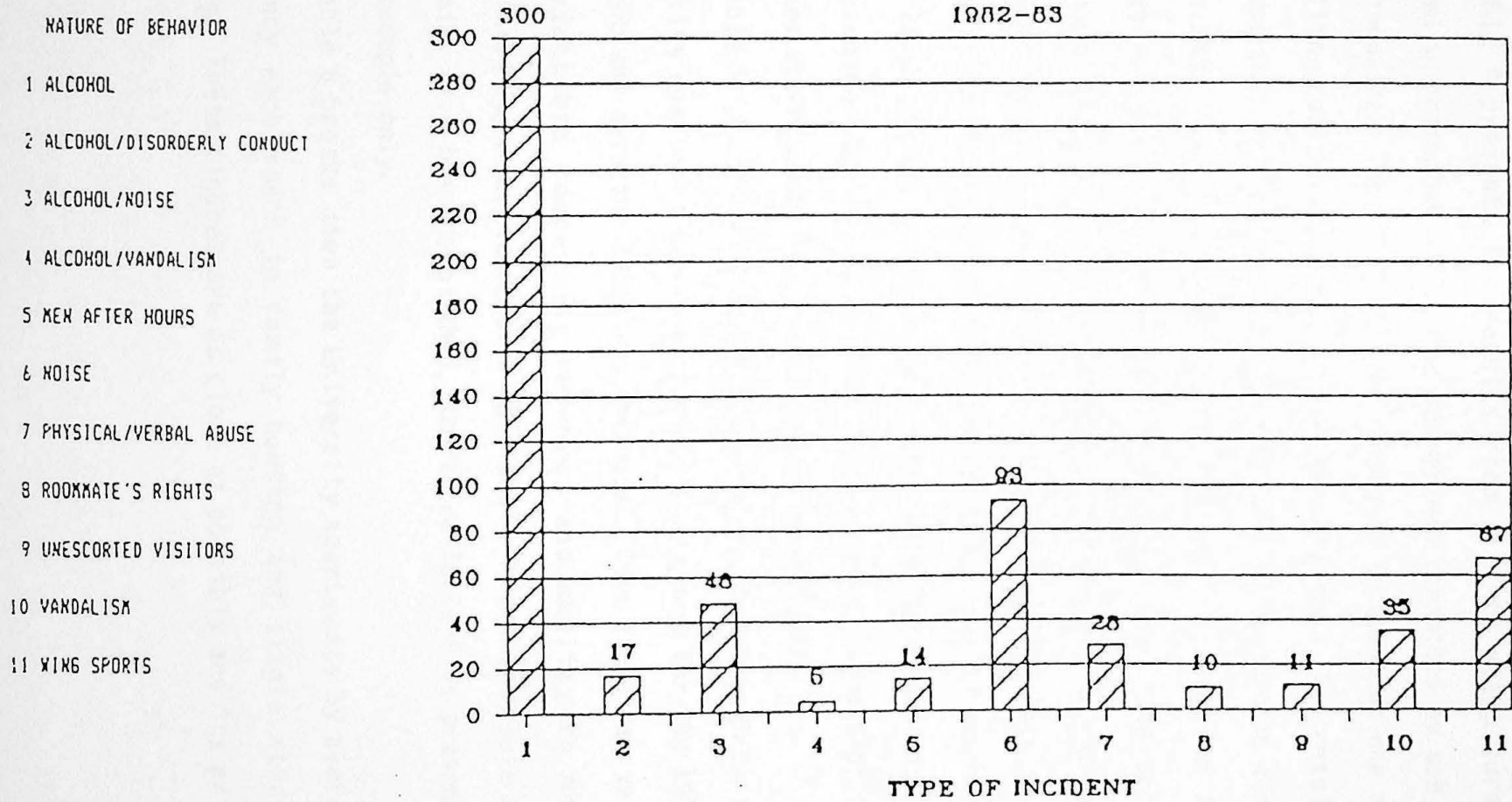


Figure 16.
Conduct Summary By Type of Incident Bar Graph

the ability to place the numbers over the bars on the graph. For example, there were 93 conduct incidents of NOISE in 1982-1983.

Table 4 presents the results from a linen usage survey conducted in September 1983. The survey was conducted by use of a questionnaire. The number of yes responses to question one was controlling for the remainder of the percentages. The results were tabulated by complexes and results were calculated in terms of percents. An average of 59.29% of the residents in the thirteen halls use the University linen service. The prime objective of the survey was to determine if the hours to exchange linen were adequate. An average of 44.28% of the residents using University linen requested changes in the hours to exchange linen. Based on this survey more evening hours were added to the linen exchange schedule. Service desk workers in each of the complexes staff these linen rooms during those hours.

Table 5 is a monthly breakdown of rental income from the University apartment complex. There is a column for the 1982-1983 rent and also the 1983-1984 increase. This table has value in projections concerning revenues and ability to meet expenditures and service debt. This table is not complete and some units have been demolished, therefore Table 5 is presented as an example only.

Table 6 breaks down the University apartments by average occupancy each month in family housing and single student housing. These figures are as close as possible and its prime

THIS REPORT CONTAINS THE RESULTS OF THE LINEX SURVEY CONDUCTED IN SEPTEMBER 1983 IN THE JOHNSTONE COMPLEX, WALSH COMPLEX AND THE WILKERSON COMPLEX.

QUESTIONS ASKED	JOHNSTONE COMPLEX				WALSH COMPLEX				WILKERSON COMPLEX			
	YES	NO	TOTAL	% YES	YES	NO	TOTAL	% YES	YES	NO	TOTAL	% YES
QUESTION # 1 DO YOU USE UNIVERSITY LINEX?	166	108	274	60.58%	218	166	384	56.77%	348	227	575	60.52%
QUESTION # 2 IF SO, DO YOU CHANGE YOUR SHEETS EACH WEEK?	100	68	166	60.24%	131	106	237	60.09%	210	162	372	60.34%
QUESTION # 3 DO YOU FEEL THE LINEX HOURS WE NOW HAVE AT (EACH COMPLEX) ARE CONVENIENT FOR YOU TO EXCHANGE YOUR SHEETS?	108	61	166	65.06%	188	52	240	86.24%	251	128	379	72.13%
QUESTION # 4 WOULD YOU LIKE TO SEE LINEX HOURS CHANGED?	73	94	166	43.98%	61	160	221	27.98%	153	208	361	43.97%
QUESTION # 5 IF SO, WHAT WOULD BE A BETTER TIME? (CHECK ONE OF THE FOLLOWING)												
8AM - 12PM	11				9				10			
10AM - 2PM	6				10				8			
1PM - 4PM	4				8				22			
4PM - 8PM	30				15				75			
6PM - 10PM	35				25				60			
** TOTAL REQUESTING CHANGE IN HOURS	86		166	51.81%	67		218	30.73%	175		348	50.29%

* THE PERCENT OF YES ANSWERS IS DERIVED RELATIVE TO THE YES RESPONSES IN QUESTION # 1.

** COMBINING THE TIMES SELECTED INTO TWO CATEGORIES

8AM TO 4PM	21	86	24.42%
4PM TO 10PM	65	86	75.58%
	86		

BY COMBINING THE TIMES SELECTED INTO TWO CATEGORIES

	27	67	40.30%
	40	67	59.70%
	67		

Table 4.
Linen Survey

Table 5.
University Apartment Income Breakdown by Month

DESCRIPTION OF UNIT	RENT 1982-83	# OF UNITS	TOTAL MONTHLY RENT	RENT 1983-84	# OF UNITS	TOTAL MONTHLY RENT
PRINCETON PARK NEW	\$70.00	26	\$1,820.00	\$74.00	26	\$1,924.00
PRINCETON PARK OLD			\$0.00			\$0.00
506-508 HARVARD	\$152.00	8	\$1,216.00	\$160.00	8	\$1,280.00
510 HARVARD-LARGE	\$92.00		\$0.00	\$97.00		\$0.00
510-HARVARD-SMALL	\$80.00		\$0.00	\$84.00		\$0.00
ONE BEDROOM BRICK	\$137.00	22	\$3,014.00	\$144.00	22	\$3,168.00
SPLIT LEVELS	\$169.00	16	\$2,704.00	\$177.00	16	\$2,832.00
SIX PLEXES	\$167.00	36	\$6,012.00	\$175.00	36	\$6,300.00
3106 5TH AVE. N. 1 BDRM FURN.	\$137.00		\$0.00	\$144.00		\$0.00
3106 5TH AVE. N. EFF. FURN.	\$129.00		\$0.00	\$135.00		\$0.00
3106 5TH AVE. N. SLP RM FURN.	\$92.00		\$0.00	\$97.00		\$0.00
314 CAMBRIDGE EFFICIENCIES	\$150.00		\$0.00	\$158.00		\$0.00
314 CAMBRIDGE 1 BDRM	\$175.00		\$0.00	\$184.00		\$0.00
314 CAMBRIDGE 2 BDRM	\$210.00		\$0.00	\$220.00		\$0.00
314 CAMBRIDGE 1TT INSURANCE	\$175.00		\$0.00	\$184.00		\$0.00
314 CAMBRIDGE VALLEY DAIRY	\$330.00		\$0.00	\$347.00		\$0.00
BERKELEY DRIVE 1 BDRM	\$137.00		\$0.00	\$144.00		\$0.00
BERKELEY DRIVE 2 BDRM	\$152.00		\$0.00	\$160.00		\$0.00
NORTHWESTERN DRIVE	\$152.00	100	\$15,200.00	\$160.00	100	\$16,000.00
72 PLEX UNFURN	\$137.00		\$0.00	\$144.00		\$0.00
72 PLEX FURN	\$157.00		\$0.00	\$165.00		\$0.00
TOWNHOUSES	\$167.00		\$0.00	\$175.00		\$0.00
ALL 23 & 24 PLEX 1 BDRM	\$137.00		\$0.00	\$144.00		\$0.00
ALL 23 & 24 PLEX 2 BDRM	\$152.00		\$0.00	\$160.00		\$0.00
ALL 24 PLEX 3 BDRM	\$169.00		\$0.00	\$177.00		\$0.00
VIRGINIA ROSE	\$194.00	15	\$2,910.00	\$204.00	15	\$3,060.00
WILLIAMSBURG & MT VER 1 UNFUR	\$149.00		\$0.00	\$156.00		\$0.00
WILLIAMSBURG & MT VER. 1 UNFUR	\$167.00		\$0.00	\$175.00		\$0.00
WILLIAMSBURG & MT VER 2 UNFU	\$164.00		\$0.00	\$172.00		\$0.00
WILLIAMSBURG & MT VER 2 FUR	\$183.00		\$0.00	\$192.00		\$0.00
GALLERY 1 BDRM	\$265.00		\$0.00	\$265.00		\$0.00
GALLERY 2 BDRM	\$295.00		\$0.00	\$295.00		\$0.00
GALLERY 3 BDRM	\$330.00		\$0.00	\$330.00		\$0.00
ALL CO-OP HOUSE SINGLE BED	\$92.00		\$0.00	\$92.00		\$0.00
ALL CO-OP HOUSE DOUBLE BED	\$80.00		\$0.00	\$80.00		\$0.00
2301 2ND AVE. N.	\$183.00		\$0.00	\$192.00		\$0.00
2317 2ND AVE. N.	\$171.00		\$0.00	\$180.00		\$0.00
2317 2ND AVE. N. BSMT	\$155.00		\$0.00	\$163.00		\$0.00
2626 6TH AVE. N. BSMT	\$200.00		\$0.00	\$210.00		\$0.00
2305 2ND AVE. N.	\$225.00		\$0.00	\$236.00		\$0.00
2315 2ND AVE. N.	\$200.00		\$0.00	\$210.00		\$0.00
1225 STANFORD	\$182.00	10	\$1,820.00	\$191.00	10	\$1,910.00
402 HARVARD	\$214.00		\$0.00	\$225.00		\$0.00
2309 2ND AVE. N.	\$200.00		\$0.00	\$210.00		\$0.00
2309 1/2 2ND AVE. N.	\$155.00		\$0.00	\$163.00		\$0.00
423-425 PRINCETON	\$200.00		\$0.00	\$210.00		\$0.00
317 1/2 CORNELL	\$171.00		\$0.00	\$180.00		\$0.00
TOTAL MONTHLY ALL UNITS			\$34,696.00			\$36,474.00

UNIVERSITY APTS
FISCAL YR 1982
AVERAGE OCCUPANCY

FAMILY HOUSING	JL	AG	SP	OC	NOV	DC	JA	FB	MR	AP	MA	JU	UNITS POSSIBLE	AVERAGE OCCUPANCY ACHIEVED	PERCENT OCCUPANCY
	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APRIL	MAY	JUNE			
1 BD BRICK	21	22	22	22	21	22	22	22	22	22	22	21	22	21.75	98.86%
SPLIT LEVEL	16	16	15	16	16	16	16	16	16	14	16	15	16	15.67	97.92%
6-PLEX	27	27	25	23	24	31	34	34	35	36	36	34	36	30.50	84.72%
8-PLEX	69	70	68	71	70	72	66	69	71	69	70	67	72	69.33	96.30%
NW DRIVE	98	97	98	98	100	100	100	100	100	98	100	94	100	98.58	98.58%
24-PLEX(CC)	69	70	70	71	72	71	70	72	72	72	72	66	72	70.58	98.03%
23-PLEX	22	22	21	22	23	23	23	23	23	23	23	20	23	22.33	97.10%
TOWNHOUSE	28	28	27	27	27	28	28	28	28	28	28	26	28	27.58	98.51%
24-PLEX(TD)	70	70	72	69	72	71	70	72	71	70	72	66	72	70.42	97.80%
V ROSE	15	13	14	14	15	15	15	15	15	15	15	13	15	14.50	96.67%
P PARK (NEW)	24	24	26	25	25	25	26	26	26	26	25	24	26	25.17	96.79%
WG II	45	45	48	47	48	48	47	48	48	47	48	44	48	46.92	97.74%
WG III	71	72	70	72	71	71	72	72	72	72	71	70	72	71.33	99.07%
GALLERY	29	35	57	60	65	66	77	77	77	75	76	63	82	63.08	76.93%
506 HARVARD	2	1	8	8	8	8	7	7	7	7	7	3	8	6.08	76.04%
3106 5TH AV	6	4	5	5	6	6	6	6	6	6	7	6	7	5.75	82.14%
TOTAL	612	616	646	650	663	673	679	687	689	680	688	632	699	659.58	94.36%
RIVERDALE †	16	14	13	9	8	7	7	6	4	4	3	1	†	7.67	†
P PARK (OLD) †	18	18	17	16	16	15	14	14	14	14	13	10	†	14.92	†
SINGLE STUDENT HOUSING															
72-PLEX	55	58	68	69	69	69	69	70	70	72	72	67	72	67.33	93.52%
MT V/WMBG	64	68	67	70	70	72	69	70	72	72	72	59	72	68.75	95.49%
314 CAMBRIDGE	9	9	9	9	7	7	8	9	9	10	11	10	14	8.92	63.69%
TOTAL	128	135	144	148	146	148	146	149	151	154	155	136	158	145.00	91.77%

† These units have been
or are in the process of
being phased out and are
not included in the total
units available

TOTAL
UNITS
POSSIBLE
857

TOTAL
OCCUPANCY
ACHIEVED
804.58

TOTAL
PERCENT
OCCUPANCY
93.88%

University Apts - Fiscal Yr 1982 Average Occupancy Table 6.

objective was to aid the director and his associate director in determining the actual vacancy trends and take management action to increase revenues and decrease vacancies or times between vacancies.

Figures 17 & 18 show the graphic presentation of Table 6. The more powerful presentation is again one of the reasons for graphics capability with the microcomputer.⁵⁴

⁵⁴Webb, Interview

University Apartments - Fiscal Yr 1982

Family Housing Occupancy By Mn

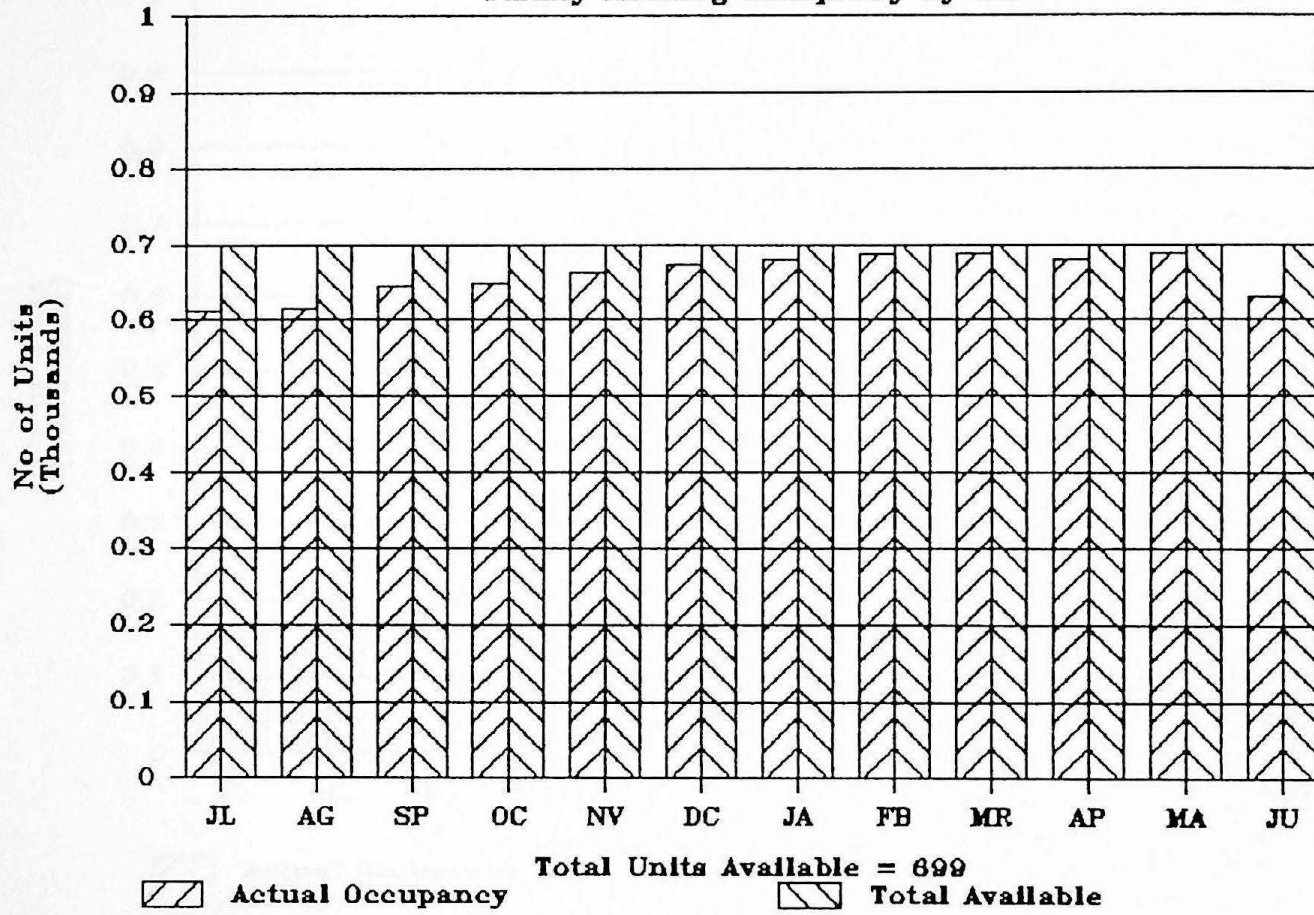


Figure 17.
 University Apartments - Fiscal Yr 1982
 Family Housing Occupancy By Mn

University Apartments - Fiscal Yr 1982

Single Housing Occupancy by Mn

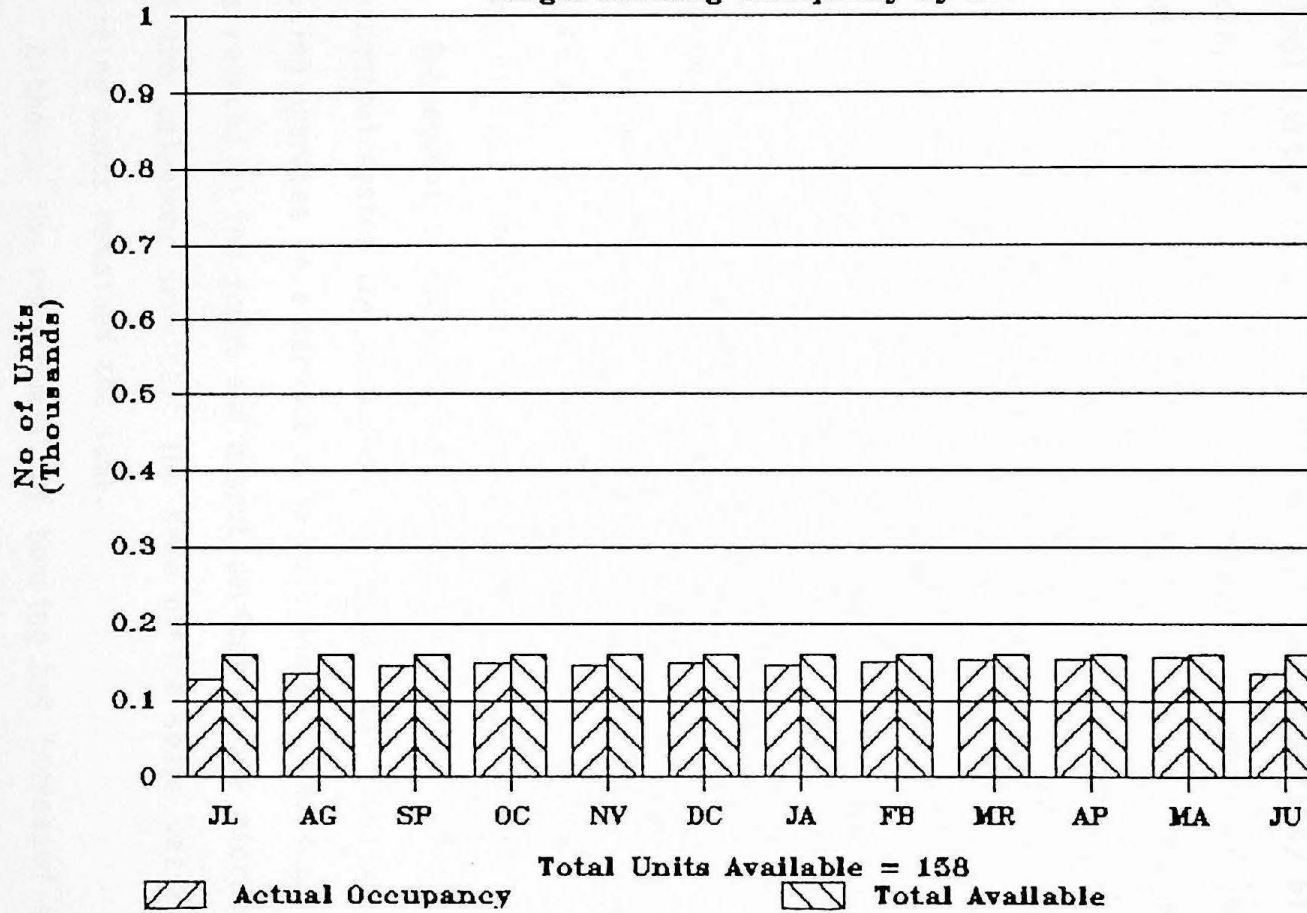


Figure 18.
 University Apartments - Fiscal Yr 1982
 Single Housing Occupancy by Mn

FINDINGS

Prior to the adaption of the IBM Personal Computer into the control system of student housing at the University of North Dakota, 4.5 staff members were required to accumulate, maintain, update and disperse all necessary data during the first week of each academic year on the motel program. The logistical support for these staff members was basic office supplies such as legal pads, pens, pencils, highlighters, file storage areas, telephone service and approximately 1500 sq. ft. of office space. The approximate staffing time expended on the performance of required duties was 16.25 hours a day for 10 working days on the motel program. This included supervisory time as well. This staffing cost, using approximate salary ranges, for this period was \$1,241.93. This is based on a total of 162.50 hours (16.25 x 10 days) divided into total staffing costs or \$7.64 an hour cost.

Subsequent to the adaption of the IBM Personal Computer into the control system the same staffing pattern was required because housing operates in a service mode full time. Logistical support was reduced to the input and output devices of the microcomputer and the telephone service. The same office space was required. Staffing costs remained the same.

Although the requirement of housing has increased annually due to increases in applications, and costs of motel housing from

\$3960.24 in 1982 to \$5616.67 in 1983, there was no need to increase staffing requirements. The director of housing attributes this to the IBM Personal Computer. This resulted in a savings of approximately \$492.00 or 40% per additional staff not needed. These figures are from the director's personal files. No information was available to evaluate the annual report contribution of the personal computer and the Interim program was not completed prior to this author's completion of case study. However the "advantage of having a microcomputer compared to having nothing far outweighs any potential cost reductions or near-term improvements in micro-technology" according to Terrence Webb.

CHAPTER IV

Benefits and Disadvantages of Investment

Microcomputers are spreading like wildfire through corporate offices as well as the non-profit sector because managers are finding a microcomputer a powerful aid in generating reports, forecasts or strategic plans and various other special analyses. These reporting and analysis needs often cannot be supplied by data processing services through main frame computers because of limited data processing resources and a backlog of service requests in support of large routine record keeping systems.⁵⁵ Central data processing departments have simply been unable to respond to user requests and backlogs in excess of two years are not uncommon.⁵⁶

Thus, the development of the microcomputer and "user-friendly" languages and programs has given end-users the opportunity to reduce manual efforts, increase productivity, and gain greater control of their own information through

⁵⁵Robert W. Backes and Robert J. Glowacki, "Microcomputers: Successful Management and Control", Management Accounting (SEPTEMBER 1983) p. 48.

⁵⁶Jim Rutledge, "Micros and MIS: Bridging the Gap", Computerworld Office Automation (NOVEMBER 1983) p. 81.

installation and generation of their own systems.⁵⁷

Microcomputers do offer many distinct benefits, as outlined below:

General Benefits

- Portability
- Software variety
- Control
- Dedication
- Networking
- Training
- Smart Terminal
- Graphics
- Data Base Management
- Low Costs

Specific Benefits

- Budgeting and Financial Analysis
- Increased Revenues - Small Practices
- Statistics
- Computer Literacy

General Benefits

- Portability. An accountant can purchase a microcomputer at a local store and plug it in. The initial preparation,

⁵⁷Ibid.

configuration and set-up time take no more than an afternoon.⁵⁸

- Software Variety. A large amount and variety of software is available for personal computers to help managers perform some tasks more productively.⁵⁹ The most important innovation in the conversion of personal computers into sophisticated management tools was the introduction of a program called VisiCalcTM (VisiCalc is a trademark of Personal Software Inc.) This electronic worksheet has lettered columns and numbered rows and incorporates many self-explanatory commands to facilitate arithmetic and editing functions. This is only one of the many software packages available to aid management.⁶⁰

- Control. Each user can have his or her own software on a small disk, have direct access to that information and the ability to change it at will for "what if" situations. This control is essential in the area of inventories, accounts receivable, and cash flow no matter how small the company may be.⁶¹

- Dedication. Personal computers are excellent for simple dedicated applications involving relatively small data sets.

⁵⁸Freeland, p. 60.

⁵⁹Ibid.

⁶⁰Sneider, p. 11.

⁶¹Harvey L. Shuster and Paul D. Warner, "Micros for Small Business: the Time is Now", Management Accounting (MARCH 1984) p. 45.

Computers are usually associated with "number crunching"-- arithmetic calculation for accounting purposes. But they can be equally useful in storing and retrieving "facts" such as names, descriptions, and categories.⁶²

- Networking. Local Area Networks (LAN) are desirable to link several micros together so that common data bases can be shared. Spurring the growth of these networks is the realization that they are an essential element of office automation systems. The bulk of communication between people in an organization takes place over distances of a half-mile or less. LAN's interconnect devices in the same room, building or campus.⁶³

Now that management and accountants have gotten their feet wet with personal computers, they want access to internal corporate data bases as well as external commercial software banks, libraries and information services.⁶⁴ Multi-user microcomputers systems (MMCSs) can support a variety of users who need to operate in an on-line, transaction-processing environment.⁶⁵ In short, if personal computers could be

⁶²Keith O. Dorricott, "EDP Micro Databases", CA Magazine (AUGUST 1982) p. 106.

⁶³Morris Edwards, "Building a Ring Around the Office", Infosystems (DECEMBER 1982) p. 46.

⁶⁴Lusa, p. 43.

⁶⁵"Multi-User Microcomputers - Impact & Opportunities" Report No. 1512 (JANUARY 1984) n.p.

integrated into the corporate data base, the full potential of both the machines and the users would be unleashed.⁶⁶

- Training. There is something about a personal computer. These machines seem to stimulate people to be more productive than they would be without the machine or with a larger "impersonal" computer.⁶⁷ Training time varies among individuals from two hours to twenty hours to become marginally proficient. This "hands on" experience gives the management accountant the awareness and insight into the mysterious world of data processing. The advantage of having and using a desktop computer for management planning, analysis and evaluation may provide a competitive edge. Tomorrow, it may be a necessity to compete successfully.⁶⁸

- Smart Terminal. A personal computer can be used as a time-sharing terminal in communication with a larger computer. When a modem, which allows communication over a phone line, is in place a user may subscribe to various data banks such as The Source or CompuServe's MicroNet to obtain a variety of information. It may be used to down load data from a large computer to another microcomputer.⁶⁹

⁶⁶Rutledge, p. 83.

⁶⁷Freeland, p. 60.

⁶⁸Sneider, p. 12.

⁶⁹Freeland, p. 61.

- Graphics. In most personal computers, business graphics is a major feature and a principal attraction for managers. Graphics meet three needs of managers: First, busy managers need to be able to absorb numbers faster. Second, most managers need a better understanding of financial reports and how they reflect the business. Third, managers need to improve their capabilities to find better plans and decisions from the data.⁷⁰ In the past, graphics were very costly and time-consuming but interactive graphics systems (IGS) now reflect current microprocessor, and display technology trends that combine to make established designs increasingly cost effective.⁷¹

- Data Base Management. The value of the desk top computer as a managerial tool has been enhanced by the introduction of user-oriented data base management systems programs. These programs allow the user to collect assorted information and then sort by any subject, select records by set criteria, apply arithmetic functions to selected records, apply logical "if" statements to select as well.⁷² Speed and flexibility of searching are the two major differences among the various database packages available

⁷⁰"Building Management Advisory Services Through Graphics". Practitioners Forum The Journal of Accountancy (JUNE 1983) p. 42.

⁷¹Walter M. Anderson, "Advances In Interactive Graphics Systems Architecture", Computer Journal (NOVEMBER 1980) p. 147.

⁷²Sneider, p. 13.

for microcomputers.⁷³

- Low Costs. The buy-in cost for a personal computer is low. As a matter of definition price is sometimes the deciding factor between micro and minicomputers. The costs vary from \$5,000 to \$15,000. This range includes most of the necessary peripherals.⁷⁴

Specific Benefits

- Budgeting and Financial Analysis. Budgeting is an essential part of any financial control system. In a small company, many budgets are informal rather than detailed written projections of sales, expenses, taxes, and profits. A formal budget easily attainable in a "what if" environment of a microcomputer offers many advantages to a small business.⁷⁵ For most businesses there are four distinct planning steps - strategic planning, detail planning, budgeting, and day-to-day action planning.

Analysis of the results of each step is the bridge to the next step.⁷⁶ In this context there are two broad categories of analytical tools: (1) those used for financial statement analysis and (2) those used in decision-making and planning. The

⁷³Dorricott, p. 106.

⁷⁴Freeland, p. 57.

⁷⁵John Pryor, "What the Small Business Owner Should Know About Accounting", Management Accounting (MAY 1983) p. 43.

⁷⁶John S. Purtill, Jr., "Six Tools of Financial Analysis", The Practical Accountant (DECEMBER 1983) p. 70.

problem with application of these tools in the past has been having the expertise and the time. The availability of software for personal computers now makes financial modeling feasible for even the smallest firms.⁷⁷

- Increased Revenues - Small Practices. "It is now certain that history will repeat itself; the recent proliferation of microcomputers has created an environment where efficient computer applications are accessible to the smallest of clients. This development now creates potential risks and rewards for even the smallest of practitioners," according to D. Campbell and M. Campbell writing for CPA Journal.⁷⁸

Although most of these newer systems are generally user friendly they are still complex and provide an opportunity for the small practitioner to expand client services to include staff training in hardware and software usage.⁷⁹

Whether the motivation to offer consulting services in this emerging area stems from a desire to avoid the loss of current clients or a desire to expand services offered, the firm must begin by building a knowledge base in this new technology.

Areas where staff members must develop their knowledge are:

- An ability to speak and understand the specific jargon

⁷⁷Ibid.

⁷⁸David R. Campbell and Mary V. Campbell, "Microcomputers for Small Practitioners", CPA Journal (JUNE 1983) p. 28.

⁷⁹Ibid.

and terminology of the computer field.

- A systematic approach to requirements analysis and system implementation should be developed.
- A knowledge of the various hardware components of microcomputers and awareness of product lines of one or two major vendors.
- A knowledge of the software available for the above hardware.⁸⁰

In addition to expanding services offered to clients, the microcomputer can greatly enhance the management of the CPA's firm. These systems improve payroll, report preparation and tax planning; efforts that are at the heart of practitioner/client relationships.⁸¹

The microcomputer, because of its adaptability, can be used in such office administration as fixed asset accounting and time and billing records. "For many accountants, who may not be strong managers or administrators, this could be one of the greatest benefits to be experienced from microcomputing," states J. Alonso.⁸²

⁸⁰Ibid., p. 33.

⁸¹Robert C. Wynne and Alan Frotman, "Microcomputers: Helping Make Practice Perfect", The Journal of Accountancy (JUNE 1983) p. 42.

⁸²Joe T. Alonso, "You're Thinking of Buying a Microcomputer?", The National Public Accountant (JUNE 1982) p. 18.

- Statistics. Statement on Auditing Standards No. 39 [para. 7], states in part that "the basic concept of sampling is well established in auditing practice".⁸³ Statistical sampling is an ever expanding responsibility of the auditor. "The auditor today is faced with (1) ever larger and more complex accounting systems, (2) pressures to uncover and report items such as illegal payments and management fraud, and (3) pressures generated by time/cost constraints," writes A. Hiltner.⁸⁴

Applications of statistical sampling include areas such as:

- internal auditing;
- developing management information;
- assisting in inventory taking;
- developing information for tax returns; and
- strengthening internal control systems.⁸⁵

The wealth of software packages available will aid not only the auditor in applying statistical sampling concepts but in more fully understanding the process of statistical analysis itself. The microcomputer can make a significant contribution in alleviating the pressures generated by time/cost constraints.

⁸³AICPA, AICPA Professional Standards (Chicago: Commerce Clearing House, Inc., 1982) AU Section 350.07.

⁸⁴Arthur A. Hiltner, "Statistical Sampling in Auditing: A Simulation", Issues in Accounting Education 1983 (American Accounting Association) p. 115.

⁸⁵Ibid.

- Computer Literacy. Computer literacy is the ability of a person to utilize modern computer systems (from micros to mainframes) to assist in problem solving, decision making, and managing information to complement and assist in the development of decision support systems.⁸⁶ Just as paper literacy has been a requirement in the past, computer literacy is fast becoming today's management requirement.⁸⁷

"As computer technology invades the office and changes the media used from paper forms to electronic ones, the need for computer skills is likely to increase in importance," writes E. Yarrish.⁸⁸ Three major reasons to invest time will enhance a manager's computer literacy. The first is to remove the unspoken, but real fear of computers; second, provide hands-on experience to these users of information systems; and third is to tap people's potential to create a better and more productive work place.⁸⁹

E. Yarrish believes a five-point organizational strategy could be used to create computer literate managers and to reap

⁸⁶R. W. Callen and Harold H. Holen, "3Rs & C Computer Illiteracy". Collegiate News & Views (SPRING 1982) p. 19.

⁸⁷Edward B. Yarrish, "Computer Literacy: a New Requirement for managers?", ABA Banking Journal (APRIL 1982) p. 55.

⁸⁸Ibid., p. 56.

⁸⁹Ibid.

the benefits of this new knowledge. This plan includes:⁹⁰

1. Increase the learning opportunities.
2. Increase rate and amount of direct hands-on computer exposure.
3. Make technology easier to acquire.
4. Encourage computerized experimentation.
5. Continuously adapt the new technologies to realities of human behavior.⁹¹

The microcomputer is seen as the most dynamic tool available today to meet this five-point plan. Its low cost and common availability are perfectly suited to this plan.⁹²

"In the long run, if we undertake and commit to a program in which computer literacy is one of the objectives, we will make a significant investment that will maintain our technological superiority in world markets," proposes R. Callen and H. Holen.⁹³

Despite their obvious value, personal computers have several limitations that management accountants should be aware of before deciding to purchase.⁹⁴

⁹⁰Ibid.

⁹¹Yarrish, p. 55.

⁹²Ibid.

⁹³Callen and Holen, p. 21.

⁹⁴Freeland, p. 61.

General Disadvantages

- Portability. The small size may continue the belief that microcomputers are toys. In fact, many practitioners view such computers as nothing more than expensive toys.⁹⁵ The microcomputer is neither a toy nor a \$5 million mainframe.⁹⁶

- Software Variety. The professional accountant may lack background in evaluating the performance capability of various software packages.⁹⁷ Software cannot be examined; only the results can be examined. Further there are no objective standards for comparison of software.⁹⁸ This lack of standardization produces major incompatibilities among software packages, among software packages and computers, and among computer hardware components.⁹⁹

This can easily be seen in the market for the operating systems programs. By virtue of its reputation and resources as a major company, and a market base large enough to trade virtually

⁹⁵Wynne and Frotman, p. 34.

⁹⁶Ibid.

⁹⁷"Microcomputers: Future Impact on the Profession", (Practitioners Forum) The Journal of Accountancy (OCTOBER 1982) p. 103.

⁹⁸Paul M. Vargo, "How to Minimize the Risk of Buying Inadequate Software", The Practical Accountant (MARCH 1983) p. 53.

⁹⁹Freeland, p. 61.

anywhere in this country and abroad, IBM has already had a direct impact on the cause for standardization.¹⁰⁰

IBM has made its operating system readily available to software authors. With this, IBM is laying the ground work for creation of a system that will eventually become the de facto standard for 16-bit desk top computers.¹⁰¹

The major drawback however to these attempts to standardize is getting enough industry leaders to agree on who is qualified to set the standards.¹⁰² This will continue to be a problem.

- Control. Security is a particularly sensitive problem either when managers want to use corporate data or their own data on their personal computers.¹⁰³ In many companies a tight rein is kept on such applications with corporate data bases. However, with the microcomputer the problem of the "garbage in, garbage out" phenomenon is more likely to occur.¹⁰⁴

The quality of information stored in the micro may not be as good as the corporate data base, therefore the executives analysis may not be good.¹⁰⁵

¹⁰⁰Lusa, p. 41.

¹⁰¹Lusa, p.42.

¹⁰²Ibid.

¹⁰³Freeland, p. 63.

¹⁰⁴"How Personal Computers Can Backfire", Business Week (JULY 12, 1982) p. 56.

¹⁰⁵Ibid.

With the level of printer technology, whether dot matrix or letter quality, the overzealous manager can take advantage of the "print-out mystique" and easily make reports as convincing as desirable without any accompanying validity.¹⁰⁶

Another common control problem is the danger of a manager storing information on a personal computer and leaving the company when no one else knows how to gain access to his file, or worse yet, walking out with the file in a coat pocket.¹⁰⁷

- Training. Personal computers can become a time sink. They require a significant investment in time regardless of being "user friendly". Managers both technically oriented and non-technically oriented can get "hooked" and disappear into their offices for hours at a time to work on their personal computers.¹⁰⁸

Next an accountant has to realize that a computer really can't do anything he can't do himself.¹⁰⁹ The effectiveness of the program and the degree of usefulness depends on the user's application experiences and creativity.¹¹⁰

- Data Base Management. While many data base management programs

¹⁰⁶Ibid.

¹⁰⁷Backes and Glowacki, p. 49.

¹⁰⁸Freeland, p. 63.

¹⁰⁹Alonso, p. 19.

¹¹⁰Sneider, p. 12.

permit flexibility, the application is limited by the amount of mass memory storage. This can be remedied by hard disk drives but at an additional cost to fully utilize data base management.¹¹¹ Hardware limitations also include the speed with which processing occurs. A small computer cannot handle large volumes very fast compared to larger machines. In cases where a large number of input/output operations are involved, it is very easy for program execution time to exceed an hour.¹¹²

- Low Costs. Micro-mechanization, while often cheaper than a mainframe alternative, is not as inexpensive as it appears at first glance. Hardware costs have become a fairly insignificant portion of total systems costs.¹¹³ The software costs can be excessive. But the comparative cost of the software component of a system relative to the hardware, puts additional pressure on the already present need to reduce software costs.¹¹⁴

"The growth of the share of total cost taken by software is not a new phenomenon, but current analysis suggests that these problems will continue in the 1980s and 1990s for micros," writes P. A. Dearnley.¹¹⁵

¹¹¹Ibid.

¹¹²Mansfield, p. 60.

¹¹³Mansfield, p. 60.

¹¹⁴p. A. Dearnley, "Software Development for Microcomputer Data Processing Systems", Computer Journal (JANUARY 1982) p. 257.

¹¹⁵Ibid.

Controlling costs presents a problem for the corporate world. Users do a lot of back-door purchasing--but corporations want more cost-effectiveness.¹¹⁶ Restricting choices, distributing financial accountability along with computer funds, giving opportunity to buy outside services for computing needs to encourage a competitive incentive to lower costs, are all attempts at controlling computer costs.¹¹⁷

- Service. The quality and variety of service available may be a limiting factor. One typically has to depend on the manuals; i.e., software documentation, and a few phone calls.¹¹⁸

In assessing the pros and cons of the microcomputer, M. Belden points out the "Six Painful Truths About Data Processing".¹¹⁹

Managers must learn to live with these truths:

1. Data processing success is expensive.
2. Management involvement is a critical factor.
3. Management should not rely too much on the imagination, perception or initiative of the data processing staff.

¹¹⁶"Taking Control of Computer Spending", Business Week (JULY 12, 1982) p. 59.

¹¹⁷Ibid.

¹¹⁸Freeland, p. 62.

¹¹⁹Belden Menkus, "Six Painful Truths About Data Processing Success", Administrative Management (JANUARY 1976) p. 70.

4. Careful planning is essential.
5. Management must be cautious about innovations.
6. Not all benefits of computer use may be quantifiable.¹²⁰

Although expressed in the context of large computer installation well over eight years ago, much is still appropriate in assessing microcomputers. In 1975, Michael Feuche stated ". . . the real history of the computer may paradoxically be that of its decline--decline in size and in price, so that as its capabilities grow, they become available to ever larger numbers of users".¹²¹

With the decline in size and price of computers and bearing in mind the fourth painful truth that careful planning is essential, the importance of careful planning is apparent. Management involvement means that the team will find the answers to the right questions not only as plans are being formulated but also as they are carried out.¹²²

At the least the management team, which should include the accountant, should ask and get answers to broad questions like:

¹²⁰Ibid.

¹²¹Michael Feuche, "Thinking Big About Small Computers", Administrative Management (AUGUST 1975) p. 28.

¹²²Marvin C. Kelly, "Data Communication Plans - Some Financial Aspects", Selected Papers 1972 Haskins & Sells (FEBRUARY 1972) p. 144.

1. What is the hardware's capability or the manufacturers specifications translated into users specific needs?
2. What is the actual business application to be computerized?
3. Is the user truly flexible and capable of change?
4. What will be the actual needs of the business as the system is used today and in the future?¹²³

These questions highlight the large number and diverse nature of the unknowns. These uncertainties constitute the inherent problem of planning. Once the financial parameters have been developed, a task force can be assembled to do a thorough and serious job of exploring feasible systems. Three points are important: the progressively more detailed examination of the plan; the periodic reassessment of opportunities; and the continuous review of progress. Taken together they provide the feedback vital to the success of the project.¹²⁴

Five basic steps are essential to every computer purchase, no matter how large or small the computer:

1. Understanding the client's (or your) business;
2. Developing the client's information requirements;
3. Contacting the computer vendors;

¹²³Ibid.

¹²⁴Ibid.

4. Evaluating the vendors' proposals, and
5. Negotiating the final contract.¹²⁵

By practicing these five steps, a firm can ensure that the hardware and software will match the client's needs as closely as possible.¹²⁶

The microcomputer can become the tool for solving accounting and planning problems as long as a systematic approach is taken in its acquisition, implementation, and operation. "Proper guidance in its installation is critical to the successful use of a microcomputer in your company," writes Shuster and Warner for *Management Accounting*.¹²⁷

¹²⁵John A. Wixson, "Five Basic Steps to Computer Acquisition", *The Practical Accountant* (OCTOBER 1983) p. 72.

¹²⁶Ibid.

¹²⁷Shuster and Warner, p. 48.

CHAPTER V

Conclusion

"The accounting profession has been frustrated by the difficulties encountered in attempting to properly utilize the computer. Management, too, has often found that information stored in the data processing systems has been practically unobtainable. Both are searching for a key to the computer."¹²⁸

Written in 1972, H. Denman Lawrenson was speaking to the issue of an information gap.

Microcomputers and their explosive present and future performance may very well be that key. Not only does it offer potential opportunities to accountants but it also has an impact on professionals of all types. It can assist accountants in performing routine bookkeeping tasks to performing highly complex calculations.

But yet there is another feature of the microcomputer that perhaps stands out more than any other. In a technically-oriented society, an impressive presentation or startling graphics display will quite often be center stage of any financial report. Like it or not, the business community is in

¹²⁸H. Denman Lawrenson, "A Key to the Computer", Selected Papers 1972 Haskins & Sells (MARCH 1972) p. 88.

a world of "Star Wars" and high-tech razzle-dazzle. The rules of the game are quickly changing, and the first step is always the most difficult. Every accountant must think in terms of the way automation can improve their firm's productivity and profitability.

"No productivity gains result, however, without skilled people and management, and the exponential growth in computer use has created a severe shortage of computer professionals," writes R. Nolan.¹²⁹

According to a 1983 Robert Half survey of starting salaries, there will be a computer in every office and perhaps on every desk by 1990, and because of the impact of computers, individuals with exposure in data processing will have a competitive advantage.¹³⁰

The need to be computer literate exists now in business. Are Business schools meeting this need to be computer literate? Most schools of business have modified or created a curriculum that includes one or more courses in data processing. These courses typically expose a student to one of the computer languages, just as an English course exposes a student to grammar. This minimal exposure is quite frankly not

¹²⁹Nolan, p. 73.

¹³⁰"Financial Salaries Rise 3.9 Percent" Accounting Major 7 (NOVEMBER 1983) p. 2.

enough. What is required is the development of the understanding of the concepts of information systems.

The academic community is indeed wrestling with the impact of the computer in the classroom. A noted author, Yuji Ijiri, believes there are two major problems in education geared to the computer. The first is the learning of arithmetic. It is analogous to the effect created by the proliferation of hand held calculators. It is difficult to get someone "to walk when a car is conveniently available".¹³¹

The second is the erroneous impression of objectivity and precision that a computer is bound to create on the accounting process. "The computer forces accountants to be overly definitive and precise even where accountants cannot . . . The human dimension to accounting cannot be factored into a computer."¹³²

While the computer dimension may be new, the human dimension is not. "Accounting is not only a profession but a discipline in social science. Both deal with people."¹³³

It is without question that there is no foreseeable end to the small computer technology, therefore a plan of acquisition or

¹³¹Yuji Ijiri, "New Dimensions in Accounting Education: Computers and Algorithms", Issues in Accounting Education 1983 (1983) p. 172.

¹³²Ibid., p. 172.

¹³³Ibid.

taking stock of present computer capabilities is not a waste of time.

In terms of the small practitioner, the rewards in practice protection and productivity and expansion of practice opportunities seem real. Those who delay implementation of a plan may risk a loss of a significant portion of their client base to more aggressive practitioners in the near future.

Microcomputers will continue to erode the bottom end of many local practices; as computers get less expensive and the accounting and tax software get better. Aggressive accounting firms will be actively marketing services that focus on the needs of clients to save money; to be more profitable; and to be more efficient.

Accountants and auditors must offer a quality service; both up-to-date and technically strong, if the profession is to continue in the role of business advisers.

This author's personal interest in microcomputers and hands-on experience with the IBM PC has already proven to be that "competitive edge".

APPENDIX

Special Report

Fox & Co National Microcomputer Survey

On April 12, 1983 a preliminary report draft was submitted to the board of directors of Fox & Co. P.C. for their review.

That report titled "National Microcomputer Survey Report of Findings and Recommendations", was the culmination of a a project started in February 1983. See Exhibit I and II.

Objectives

The objectives of the project were:

- To identify the microcomputer systems being used by the Fox practice offices.
- To evaluate alternative microcomputer systems.
- To recommend an approach for acquiring microcomputer systems on a firm-wide basis.

Scope

The scope of project included a survey of the practical office installations of microcomputers, their uses, plans for acquisition and preferences. The scope was limited to detailed examination of two microcomputers; the Apple and IBM Personal Computer.

The scope limitation was because these two devices were known in general, to be the most common devices used by members of the firm.

Approach

Survey forms were prepared and automation consultants from each of the firm's districts were assigned responsibility for completion.

Comparative testing of the Apple III and IBM personal computer were performed. Computer vendors were contacted to determine price and volume discounts offered.

The following presentation: Section I. Management Summary, (p. 1-3) and Section II. Detailed Findings and Recommendations, (p. 5), demonstrate one firm's approach to the new technology. The Board did review this study, but approval was held pending the final draft of the report submitted in May, 1983.

Exhibit I
Management Summary

I. MANAGEMENT SUMMARY

Objectives

In February 1983, a project was added to the BAS Automation Consulting Action Plan. The objectives of the project are:

- To identify the microcomputer systems being used by the Fox practice offices.
- To evaluate alternative microcomputer systems.
- To recommend an approach for acquiring microcomputer systems on a firm-wide basis.

Scope

This project included a survey of practice office installations of "microcomputers," their uses, plans for acquisition and preferences. The scope did not include the firm sanctioned TI 1123 because it was believed that the intended use of the TI 1123 is different from that of other microcomputers within the firm.

Our scope was limited to a detailed examination of two microcomputers; the Apple and IBM Personal Computer. We limited the scope, in this regard, because these two devices were known, in general, to be the most common devices used by members of the firm.

Approach

To accomplish the objectives of the project, the following approach was used.

Survey forms were prepared and automation consultants from each of the firm's districts were assigned the responsibility to survey practice offices in their region. The surveys were compiled and the results are presented in Section III of this report.

We performed comparative testing of the IBM Personal Computer and the Apple III to identify the technical strengths and weaknesses of each system. We contacted computer vendors to determine the prices and volume discounts offered.

Additional Tasks to be Completed

Prior to issuing a final report, additional work needs to be done in the following areas:

- Evaluate and classify several printers
- Project the opportunity cost to be incurred for training
- Determine the objectives and timing of software systems which Tymeshare is developing for the IBM PC
- Project software costs

Exhibit I

Continued

Summary of Findings and RecommendationsInstalled Systems

Seventeen offices have 23 microcomputers installed, an acquisition rate of 1.35 units per office. Twenty-three and one-half percent of those offices acquiring microcomputers acquired more than one unit.

Ninety percent of those acquired were configured with two or more disk drives. Average memory size is 135,000 characters. Two-thirds of the IBM Personal Computers and all of the Apple III's (30% of installed units) were acquired with at least 256,000 characters of memory.

Office Preferences

Thirty percent of Fox offices preferred the IBM Personal Computer, eleven percent preferred the Apple, four percent preferred another brand and fifty-five percent had no preference or did not respond.

Fifty-one percent of the offices responded that a "standard configuration" acquired nationally would be acceptable. Forty-four percent had no response and five percent stated that a standard configuration was not acceptable.

Planned Acquisitions

During the next fiscal year, thirteen offices intend to purchase an additional 17 microcomputers. Sixty-five percent (11) will be IBM Personal Computers with 256,000 characters of memory and 2 disk drives. Employee interest ranged from 44 to 114 units.

Microcomputer Uses

Nineteen offices reported approximately thirty different business uses for microcomputers using eighteen different software packages. Two software packages, Visicalc and Supercalc, account for more than 67 percent of the business uses.

Equipment Evaluation and Recommendation

The IBM Personal Computer is more closely suited to the needs of the firm than the Apple III. IBM Personal Computers should be acquired with at least 256,000 characters of memory, 2 disk drives, a monochrome (CRT) display and the IBM-PC Disk Operating System (DOS). The retail price of this hardware is \$4,033.

We are not recommending specific printers at this time. We believe that printer selection depends significantly on the individual offices intended use. Several printers will be evaluated and alternatives presented to the local offices for their selection. We recommend that employees be included in the purchase plan.

Based on planned acquisitions of 11 units, the total cost, at retail, would be \$44,363, excluding printers. Should the firm decide to include employees in the purchase, and obtain the 16% discount, the firm will save \$7,098 reducing its hardware cost to \$37,265.

Exhibit I

Continued

Recommended Software

Based on the number of functions presently developed using Supercalc and Visicalc, we recommend that the local offices acquire Supercalc, Visicalc or both with a microcomputer acquisition.

We also recommend that each office with an IBM Personal Computer acquire a software package named PC Tutor. Offices using Visicalc on an IBM Personal Computer should consider acquiring a software package named CDEX - Training for Visicalc. These training aids are useful and inexpensive ways to provide new users with training.

Coordination of Acquisition and Use

We recommend that the firm establish the position of National Coordinator of Microcomputers to coordinate the acquisition and use of microcomputers within the firm.

Training of Personnel

We recommend that, initially, training be done at the local office level. As business functions are expanded, further training should be incorporated into our national training program. National training would teach microcomputer uses specific to the individuals discipline.

Other Requirements

We recommend that offices which are presently considering the acquisition of TI 1123 microcomputers delay their decision until further study can determine if the IBM Personal Computer using Tymeshares software is capable of meeting their needs.

We recommend that the firm initiate a study to recommend portable microcomputers which are most compatible with the IBM-PC.

System Billing

We recommend that the offices use a flat rate per hour of use to charge for equipment. We also recommend that a logon, logoff and usage reporting program be developed for national distribution to capture time and charges.

System Scheduling

Scheduling of system time should be centralized within the local office. The Partner-in-Charge (or designate) should be assigned responsibility for conflict resolution. Our detailed findings and recommendations provide more specific recommendations which are used in some offices.

All excerpts reprinted with permission of Fox & Co., P.C.

Exhibit I

Continued

II. DETAILED FINDINGS AND RECOMMENDATIONSEquipmentRecommendation

Based on our evaluation of the IBM Personal Computer and the Apple III microcomputer systems, we believe the IBM Personal Computer (PC) is the system that more closely meets the firm's current and anticipated future needs. The following technical and nontechnical considerations favor the IBM-PC:

1. Ability to expand the system's internal memory (one million characters) which increases its capabilities.
2. Greater storage capability on a single diskette.
3. Significantly better quality of standard screen display.
4. The operating system is easy to learn.
5. IBM offers suitable maintenance agreements, if desired.
6. The cost is comparable to other similar systems.
7. The firm's practice offices presently have, or are planning to acquire, more IBM-PC's than any other system.

The following intangible considerations also favor the IBM-PC:

1. Industry observers believe the future development of packaged software will be geared toward the IBM-PC or its look-alikes.
2. Sales of this device are on the order of 20,000 per month versus the 3,000 per month for the Apple III. Therefore, the probability that our clients will have or have acquired an IBM-PC appears greater than that of an Apple III.

Configuration

Based on hands-on experience, discussions with other Fox & Company users and the results of the national survey, we believe that the following configuration of the IBM-PC should satisfy the needs of most users in the firm:

- IBM-PC with 256K memory
- Monochrome display terminal
- Two diskette drives (320K each)

Although the IBM-PC can accommodate up to one million characters of memory, hard disk drives, telecommunications equipment and other components, we do not believe these upgrades are necessary for the majority of offices initially. Therefore, they are not included in our recommended standard configuration for volume purchases.

On May 27, 1983 the final report was presented to the board for approval. The final report included an expansion of the previous Section II (see Section II p. 5). The new section, Section III. Detailed Findings and Recommendations, (p. 8) gave a more detailed presentation for consideration.

The board voted to endorse IBM Personal Computer acquisition, as a standard for their offices.¹³⁴

¹³⁴Gene Blish, Interview held during research work, Denver, Colorado, JANUARY 1984.

Exhibit II

Detailed Findings and Recommendations

III. DETAILED FINDINGS AND RECOMMENDATIONS

This section presents more detail of the information presented in Section II.

EQUIPMENT

Findings

The following technical and nontechnical considerations favor the IBM PC:

1. Ability to expand the system's internal memory (one million characters) which increases its capabilities.
2. Greater storage capability on a single diskette.
3. Significantly better quality of standard screen display.
4. The operating system is easy to learn.
5. IBM offers suitable maintenance agreements, if desired.
6. The cost is comparable to other similar systems.
7. The firm's practice offices presently have, or are planning to acquire, more IBM PC's than any other system.
8. Timberline Systems (Tymshare OPAS System) is in the process of final quality assurance of a client write-up system for the IBM PC.
9. Tymshare is in the process of developing the IAS (Internal Accounting System) Data Entry software for the IBM PC.
10. The IBM PC is presently capable of functioning as a terminal on the firm sanctioned TI 300 and 600 series systems.

The following intangible considerations also favor the IBM PC:

1. Industry observers believe the future development of packaged software will be geared toward the IBM PC or IBM PC compatible equipment.
2. Sales of this device are on the order of 20,000 per month versus the 3,000 per month for the Apple III. Therefore, the probability that our clients will have or have acquired an IBM PC appears greater than that of an Apple III.

Further detail on the determination of considerations and support of findings can be obtained from Schoen C. Fitzgerald (Wichita office).

Recommendation

Based on our evaluation of the IBM Personal Computer and the Apple III microcomputer systems, we recommend the IBM Personal Computer (PC). It more closely meets the firm's current and anticipated future needs for personal computers.

SELECTED BIBLIOGRAPHY

Books

IBM PC User Reactions, Requirements & Plans - 1984 Report #1516.
n.p. IBM (DECEMBER 1983).

Multi-User Microcomputers - Impact & Opportunities Report #1512.
n.p. IBM (JANUARY 1984).

Selected Papers 1972 Haskins & Sells "A Key to the Computer"
H. Denman Lawrenson (MARCH 1972).

Selected Papers 1972 Haskins & Sells "Data Communication Plans -
Some Financial Aspects" Marvin C. Kelly. (FEBRUARY 1972).

Statement on Auditing Standards No. 39 [AU 350.07] n.p. A/CPA,
n.d.

Statement of Financial Accounting Concepts No. 1 Objectives of
Financial Reporting by Business Enterprises. n.p. FASB, ISSUED:
NOVEMBER 1978.

Statement of Financial Accounting Concepts No. 2 Qualitative
Characteristics of Accounting Information. n.p. FASB, ISSUED:
MAY 1980.

Studies in Accounting Research #15 "Adaptive Behavior:
Management Control and Information Analysis" Hiroyuki Itami

Periodicals

"Building Management Advisory Services Through Graphics".
(Practitioners Forum). The Journal of Accountancy 155 (JUNE
1983): 42-44.

"Documentation Guidelines for Microcomputer Software".
(Practitioners Forum). The Journal of Accountancy 156 (JULY
1983): 40-48.

"End-User Computing: The Information Center and PC's".
(Management Information Systems). Management Accounting 65
(FEBRUARY 1984): 12, 77.

- "Financial Salaries Rise 3.9 Percent". (Newsletter). Accounting Major 7 (NOVEMBER 1983): 2.
- "How Personal Computers Can Backfire" (Information Management). Business Week 2748 (JULY 12, 1982): 56-59.
- "Microcomputers: Future Impact on the Profession" (Practitioners Forum). The Journal of Accountancy 154 (OCTOBER 1982): 103-104.
- "Micro-Mainframe Links: A Practical Reality?". (Management Information Systems). Management Accounting 65 (MARCH 1984): 12, 76.
- "NAA's Micro Control Conference" (Computers and Accounting). Management Accounting 65 (FEBRUARY 1984): 16.
- "Taking Control of Computer Spending" (Data Processing). Business Week 2748 (JULY 12, 1982): 59-60.
- Alonso, Joe T. "You're Thinking of Buying a Microcomputer?". The National Public Accountant 27 (JUNE 1982): 17-20.
- Anderson, Walter M. "Advances in Interactive Graphics Systems Architecture". Computer Journal 23 (NOVEMBER 1980): 147-149.
- Backes, Robert W. and Glowacki, Robert J. "Microcomputers: Successful Management and Control". Management Accounting 65 (SEPTEMBER 1983): 48-51.
- Callen, R. W. and Holen, Harold H. "3Rs & C Computer Illiteracy". Collegiate News & Views 35 (SPRING 1982): 19-21.
- Campbell, David R. and Campbell, Mary V. "Microcomputers for Small Practitioners". CPA Journal 53 (JUNE 1983): 28-33.
- Dearnley, P. A. "Software Development for Microcomputer Data Processing Systems". Computer Journal 25 (MAY 1982): 253-257.
- Dorricott, Keith O. "Micro Databases". CA Magazine 115 (AUGUST 1982): 106-107.
- Feidelman, Laurence. "Small Business Computers - Which One Is Right for You?" The Office 94 (JULY 1981): 84-86, 138.
- Feuche, Michael. "Thinking Big About Small Computers". Administrative Management 36 (AUGUST 1975): 28-38.
- Freeland, James R. "Can a Personal Computer Really Help You?". Business Horizons 26 (JANUARY-FEBRUARY 1983): 56-63.

Friend, David. "The New Promise of Graphic Information Systems". Financial Executive 50 (OCTOBER 1982): 20-26.

Hiltner, Arthur A. "Statistical Sampling in Auditing: A Simulation". Issues in Accounting Education 1983 (1983): 115-121.

Ijiri, Yuji. "New Dimensions in Accounting Education: Computers and Algorithms". Issues in Accounting Education 1983 (1983): 168-173.

Latham, Bill. "How to Select a Personal Computer". Cost and Management 56 (SEPTEMBER-OCTOBER 1982): 58-60.

Lin, W. Thomas and Harper, William K. "A Decision-Oriented Management Accounting Information System". Cost and Management 55 (NOVEMBER-DECEMBER 1981): 32-36.

Lusa, John M. "Buying a Desk-Top Computer? You're On the Road to a Dilemma". Infosystems 29 (DECEMBER 1982): 40-44.

Mansfield, Mark D. "Plugging the DP Gap: Small Computers for Big Business". Management Accounting 65 (SEPTEMBER 1983): 58-61.

Menkus, Belden. "Six Painful Truths About Data Processing Success". Administrative Management 37 (JANUARY 1976): 70-75.

Morris, Edwards. "Building a Ring Around the Office". Infosystems 29 (DECEMBER 1982): 46-48.

Nash, John F. and Giovinazzo, Vincent J. "Selecting Accounting Software Packages". CPA Journal 52 (OCTOBER 1982): 40-45.

Nash, John F. and Giovinazzo, Vincent J. "Selecting Computer Hardware". CPA Journal 52 (SEPTEMBER 1982): 57-63.

Nolan, R. "Managing Information Systems by Committee". Harvard Business Review 60 (JULY-AUGUST 1982): 72-79.

Pappas, Alceste T. "Management Challenges of The 1980's". The Journal of College and University Student Housing 13 (SUMMER 1983): 3-8.

Peterson, Russell J. and Grimlund, Richard. "CADRAS: Computer Assisted Data Recording and Analysis". Issues in Accounting Education 1983 (1983): 146-148.

Pryor, John. "What the Small Business Owner Should Know About Accounting". Management Accounting 64 (MAY 1983): 42-45.

Purtill Jr., John S. "How to Improve the Bottom Line with Better Financial Analysis: Six Basic Analytical Tools". The Practical Accountant 16 (DECEMBER 1983): 69-76.

Rose, Fawn A. "Microcomputers for Financial Consulting". Management Accounting 65 (FEBRUARY 1984): 42-45.

Rutledge, Jim. "Micros and MIS: Bridging the Gap". Computerworld Office Automation 5 (NOVEMBER 1983): 81-83.

Shields, Michael D. "Effects of Information Supply and Demand on Judgment Accuracy: Evidence from Corporate Managers". The Accounting Review 58 (APRIL 1983): 284-301.

Shuster, Harvey L. and Warner, Paul D. "Micros for Small Business: the Time is Now". Management Accounting 65 (MARCH 1984): 45-48.

Sneider, Allen. "Desktop Computers: Extending Management Capabilities". Journal of Property Management 47 (NOVEMBER-DECEMBER 1982): 11-13.

Vargo, Paul M. "How to Minimize the Risk of Buying Inadequate Software". The Practical Accountant 16 (MARCH 1983): 53-56.

Welch, Mark and Graham, Patricia. "The Buyer's Guide to Printers: Dot Matrix and Letter-quality". The Practical Accountant 16 (MAY 1983): 81-83.

Wixson, John A. "Five Steps to Helping a Client Select a Computer System". The Practical Accountant 16 (OCTOBER 1983): 71-82.

Wynne, Robert C. and Frotman, Alan. "Microcomputers: Helping Make Practice Perfect". The Journal of Accountancy 152 (DECEMBER 1981): 34-39.

Yarrish, Edward B. "Computer Literacy: A new requirement for managers?" ABA Banking Journal 74 (APRIL 1982): 52-56.

SOURCES CONSULTED

Interviews

Blish, Gene. Interview Held January 1984. Denver, Colorado (JANUARY 1984).

Dewald, Derrald. Interview Held During Case Work. Grand Forks, North Dakota (DECEMBER 1983).

Webb, Terrence. Interview Held During Case Work. Grand Forks, North Dakota (OCTOBER 1983).