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A Comparative Study of IBM PC and Apple Macintosh Electronic Publishing Systems

Valeris A. Moen

A COMPARATIVE STUDY OF IBM PC AND APPLE MACINTOSH ELECTRONIC PUBLISHING SYSTEMS

by

Valerie A. Moen

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This thesis meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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ABSTRACT

The purpose of this study was to compare the IBM PC and the Apple MacIntosh electronic publishing systems. The study fulfilled the following objectives: (1) to identify a list of operational and functional characteristics that a model electronic publishing system would possess; (2) to identify which characteristics (operational and functional) are featured in each of the selected electronic publishing systems; and (3) to provide a comparative analysis of the cost of purchasing hardware and software necessary for an electronic publishing system.

Method

Journals and industry and business literature were utilized to provide a list of operational and functional characteristics. This list along with the selected systems were compiled into tables. The researcher utilized both the systems and their documentation to determine if the listed characteristics were present or absent within each system and to what extent they were used within each system. A comparative analysis of the cost of each system was obtained from contacting the manufacturers of each system.

Conclusions

The selected systems possess almost identical operational and functional characteristics. The greatest difference is that the IBM system is capable of utlizing the characteristics present to a greater range of purposes than the MAC system. Although the IBM system is more versatile the MAC system provides

superior documentation, written and on-line. The Mac documentation provides a clearer explanation of the characteristics it possesses and places in a logical progression the tasks necessary to produce a printed document.

The cost analysis revealed that the educational cost for both systems is considerably less than the retail cost and the Mac system was substantially lower than the IBM system in both educational and retail markets.

If a given establishment wishes to employ a microcomputer there are several factors to take into consideration. These factors are the cost of the system, the on-line and written documentaion provided with the program and the knowledge of the individual utilizing the system.

CHAPTER 1

INTRODUCTION

The microcomputer industry is a diverse and dynamic enterprise. Each year a new technology is introduced which has the potential to transform the utilization of the personal computer.

One of the personal computer's most current applications is electronic publishing. Ynostroza (1986) wrote, "It is through developments in technology that it is now possible to set up a system that can be used by everyone involved in publishing and communications" (p. 2). Though the systems vary in complexity and capability, electronic publishing systems can be used to construct inter-departmental memos, weekly newsletters, financial reports, proposals, brochures, and product and corporate advertising. Ynostroza (1986) stated, "These results may be composed in ways much more flexible than traditional printing-industry technology allows. When put into final form, these documents can be output on a wide variety of devices, depending on the requirements for speed, quality, and run length" (p. 2).

Ynostroza (1986) also stressed, "In it's broadest definition, electronic publishing embraces information and its communication in all forms, traditional or not, whether it is intended for a company's internal or external use. More specifically, it is the storage/retrieval, manipulation, production, and dissemination from a variety of sources to a variety of recipients" (p. 2). Electronic publishing is a computerized system for the creation, composition, page make-up, and output of finished medium- to high-quality master pages" (XyVision 1986, p. 1).

Kapor (1986) suggested that, "Hard copy is the most accepted form of corporate communication; electronic, by emulating graphic arts attributes, can fulfill this growing demand by providing it in a timely, cost-effective manner" (p. 26).

Printing and publishing has its roots entrenched in the traditional graphic arts industry. A tradition that began approximately 500 years ago. This industry is comprised of fragmented procedures that has satisfied the printing needs of the world by providing the highest quality printed material that often is taken for granted. Attempting to replace a portion of this organization has been met in the past with tremendous resistance because graphic arts is a labor intensive industry and cannot respond to the quick turnaround time required by users.

The mediocre performance up to this point is not an indication of an industry in peril, but of problems associated wtih an archaic industry which it is trying to refine.

Evans (1986) summarized the traditional method of producing a document as follows:

1. research information
2. search for and identify artwork
3. review changes (text preparation)
4. write rough draft
5. review draft
6. handwritten changes
7. create clean copy
8. proofread
9. proofread and edit
10. review changes
11. design mock up for pasteup
12. typeset
13. manual pasteup of text and artwork
14. review and proofread pasteup
15. edit pasteup
16. make changes per pasteup
17. give to printer (p. 8).

According to Evans (1986), computer-assisted document work flow is as follows:

1. research information
2. use data manager to retrieve text and artwork
3. modigy artwork
4. change or create text
5. merge text and graphics
6. create camera ready pages
7. view pages and change if needed
8. print proof
9. review, change on system
10. camera ready copy
11. give to printer (p. 10).

Karsh (1986) wrote that, "Programs were originally devised to provide output to phototypesetters, either by translating PC word processed files into files that can be typeset, or by emulating the coding and functionality of dedicated typesetting terminals" (p. 38).

Karsh (1986) continued to state, "The current products include more graphic display capabilities and use interfaces allowing users to work with a page in a mode resembling 'what you see is what you get' (WYSIWYG)" (p. 38).

Electronic publishing's capabilities allow the elimination of time consuming and expensive stages in document production. These factors along with electronic publishing's ability to easily be incorporated into the work flow of a business and the emergence of laser-jet printers have contributed to its escalating popularity and implementation into any environment.

In the forefront of this revolutionary technology are two leaders in the industry, International Business Machines (IBM), utilizing the PC, and Apple Computers Incorporated, utilizing the MacIntosh (MAC). These products are self-contained work stations which can provide image assembly in hours and do not require linking with another system to perform the primary function of making pages. In general, this allows a single user to perform all functions necessary

for preparation of a document.

With the appearance of electronic publishing software on the market today, a question arises as to which of the hardware/software combinations provides the most advantageous characteristics essential to the production of a document.

Purpose of the Study

Until recently, the stages essential to producing a printed document were static, time consuming, and expensive. However, with the introduction of electronic publishing anyone with access to a microcomputer has the opportunity and the means to produce a document. Electronic publishing systems have many advantages and disadvantages that must be addressed in order to select the most appropriate one.

The purpose of this study was to compare the IBM PC and the Apple MacIntosh electronic publishing systems. In order to fill the purpose of this study, it was necessary to meet the following objectives:

1. To identify a list of operational and functional characteristics that a model electronic publishing system would possess.
2. To identify which characteristics (operational and functional) are featured in each of the selected electronic publishing systems.
3. To provide a comparative analysis of the cost of purchasing hardware and software necessary for an electronic publishing system.

Limitations and Assumptions

This study was limited to:

1. The IBM PC/Studio Software FrontPage Plus Version 2.0 and Apple MacIntosh/Aldus Corporation PageMaker Version 1.0 hardware/software utilized for document production.
2. The quality of the documentation provided with the software in terms of characteristics present within each system and how they are utilized.
3. The availability of the necessary output devices for a desktop publishing system.

The author assumes that the reader has a basic understanding of printed document production and microcomputers.

Definition of Terms

The terms used in this study are defined as follows:

Central Processing Unit (CPU). The portion of the computer that contains the necessary circuitry to perform calculations that operate a program.

Desktop Publishing. A computerized system for the page composition of publications utilizing a personal computer as a stand alone work station.

Digitizer. A peripheral device which converts graphic data into digits or binary form in order for the computer to accept and process information (Goetsch 1983).

Firmware. Built in software for general computer functions.

FrontPage Plus. A page make-up program used in conjunction with the IBM PC or compatibles, version 2.0 was utilized in this study.

Functional characteristics. Those special properties built into and utilized by the electronic publishing system software to manipulate specific elements in order to enhance the primary operational characteristics.

Graphics. Any element within a document that is not the text, such as photographs, line drawings, charts, graphs, elements of this nature.

Hard disk. A disk of large capacity (generally 10 megabytes or more) that cannot be removed from its drive (Wolverton 1985).

Hardware. The equipment that makes up a computer system, as opposed to the programs, or software (Wolverton 1985).

Kerning. Adjusting the space between specific letter pairs to create more even letter spacing (Burns & Venit 1986).

Leading. A unit of measure between lines of type usually specificed in points or 1/72 of an inch.

Microcomputer. A small computer system, usually used by only one person (Wolverton 1985). A stand along computer, but may be in a computer network. Other computers are: The mainframe computer which has a centralized computer with a large capacity and fast speed; input devices (terminals) are at various locations for multiple timesharing users. The minicomputer is similar to the mainframe but has less capacity (Stenehjem 1985).

Microprocessor. An integrated circuit, or chip, that contains the circuits the computer needs to calculate and to communicate with other parts of the system (Wolverton 1985).

Mouse. A peripheral device which is moved on a table top by a tracking ball set into the underside of the device, the cursor on the screen moves in accordance with the mouse.

Operational characteristics. Involves those peripherals which support the actual central processing unit, such as: software (specifically including word processing and graphics), scanners, graphics cards, monitors, typesetters, plotters, and laser printers.

PageMaker. A page make-up program used in conjunction with the Apple MacIntosh microcomputer, version 1.0 was utilized in this study.

Peripherals. Input and output devices attached to the microcomputer used for any operation that requires gathering data externally to send data into the central processing unit or to seend it out.

Publication. Any type of printed communication.

Scanner. A peripheral device which reads a piece of artwork and transforms it into a dot pattern which is camera ready graphic to be placed on a document utilizing a page make-up program.

Software. The programs that are used with a computer system, as opposed to the equipment, or hardware(Wolverton 1985).

Text. Ordinary, readable characters, including the uppercase and lower-case letters of the alphabet, the numerals 0 through9, and punctuation marks (Wolverton1985).

Text Editor. A program used to create or change text files, also simply called an editor (Wolverton 1985).

Thumbnail Sketch. A miniature replica of a full scale page layout.

Typographical Features. The features within a page make-up program that determine how the text in a document will be treated.

WYSIWYG. Pronounced 'wizzywig,' for what you see is what you get from screen display to printed page. The display should enable you to move and edit text and to place, size, and crop graphics and see the results. The program should have options for precisely controlled placement of elements, such as snap-to guides, interactive zoom views or dialog boxes (Burns & Venit 1986).

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature is a synopsis of the inception of hardcopy communication and what instigated the changes that occurred in the industry. The review discusses the catalyst that inspired the creation of electronic publishing software and this phenomenon's current and expected impact.

A Brief History

Publisher, Whitelaw Reed installed Ottmar Mergenthaller's composing machine, the Linotype, over 100 years ago into the composing room of the New York Tribune. This machine greatly increased the availability of the typeset word and substantially increased the number of jobs and businesses in operation at that time.

Another dramatic change in hardcopy communication occurred fifty years later with the application of Walter Morey's Teletypesetter (TTS). With this machine a typewriter keyboard was used to produce paper tape which operated the line casting machine. The result of this change was a dramatic increase in the number of people required to operate, maintain, manage and finance the written communication industry (see Figure 1). Boucher (1986) stated that:

> Twenty-five years later phototypesetting became the practical tool for hardcopy communication. This phenomenon was resisted by a large percentage of commercial typesetters and publishers along with the TTS operators. Those individuals who studied and utilized the new tool for personal or business plans realized their

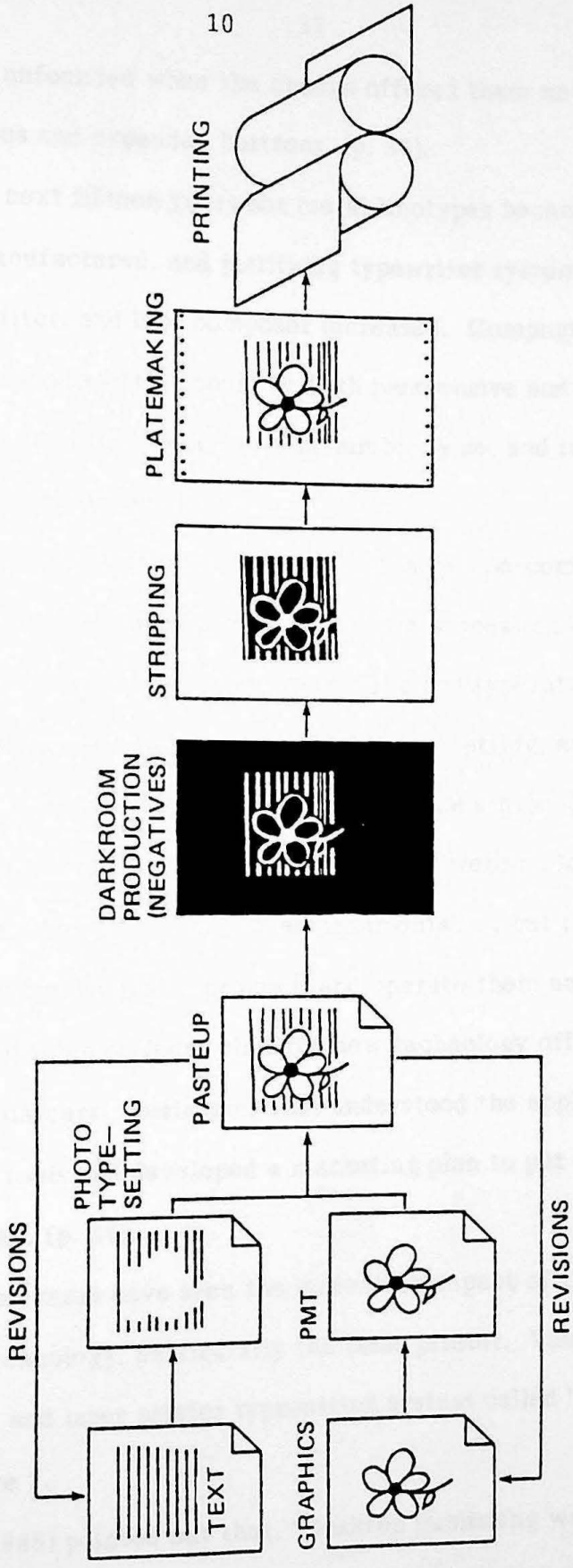

Figure 1: Traditional Publication Production

> fears were unfounded when the change offered them new opportunities and expanded horizons. (p. 34).

During the next fifteen years hot metal linotypes became obsolete and were no longer manufactured, and justifying typewriter systems such as the Varityper, Justowriter, and IBM composer increased. Compugraphic proved to the world that phototypesetting could be both inexpensive and easy to operate. That caused inplant printing to increase in number, size, and importance. Boucher (1986) further stated that:

> Small service departments increased and large non-commercial printing plants became commonplace, word processing came of age and the interface between typewriting and typesetting resulted; telecommunications, digital CRT typesetting, and 'front end' typesetting computer systems became the standards. Editors and authors became typesetters, so 'printers' were no longer needed in traditional publishing environments . . . but these new systems needed people to program and operate them and those who learned to do so found that the new technology offered rewarding careers. Businesses that understood the application of these new tools and developed a marketing plan to put them to use also did well. (p. 34).

The last ten years have seen the incredible impact of the microcomputer and its related technology, particularly the laser printer. This device spawned a microcomputer and laser printer typesetting system called 'Desktop Publishing' as shown in Figure 2.

Winkler (1986) pointed out that, "Desktop publishing was born when Apple Computers introduced its $10,000 MacIntosh personal computer and LaserWriter

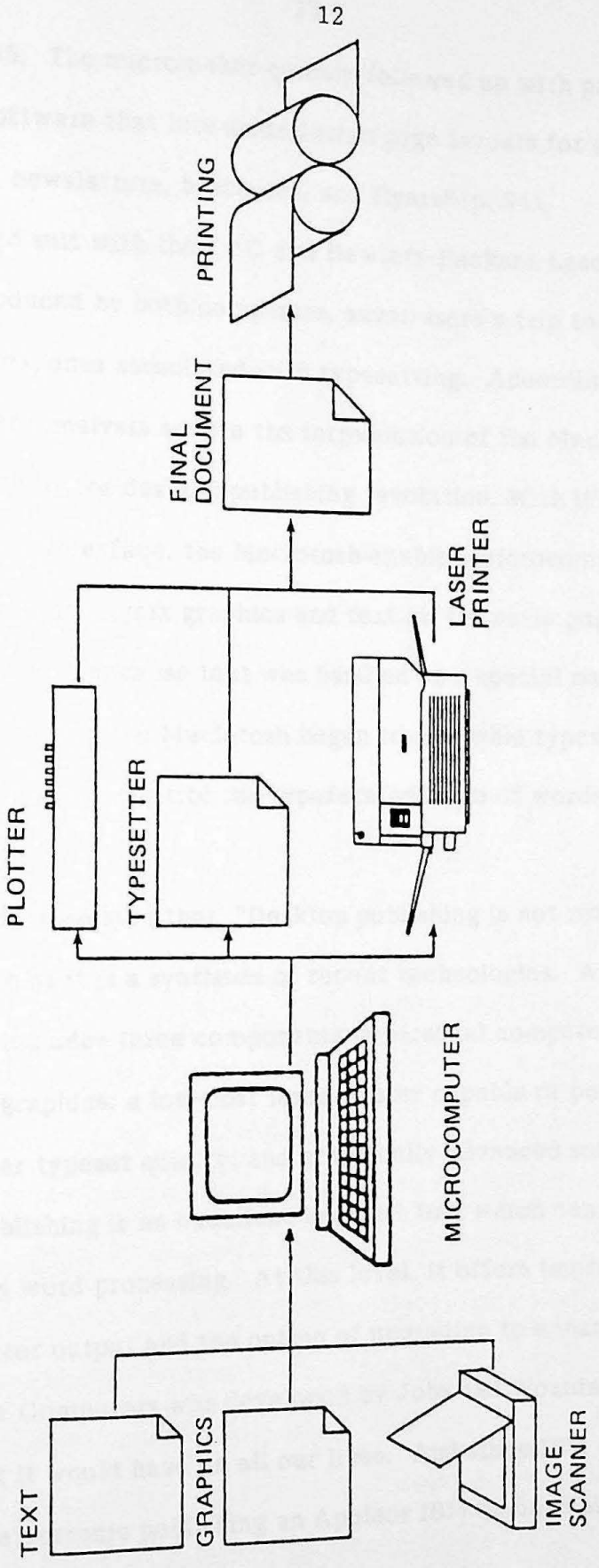

Figure 2: Electronic Publishing Production

duo in January 1985. The micromaker quickly followed up with page make-up and composition software that lets users design page layouts for simple printing jobs like employee newsletters, brochures, and flyers" (p. 94).

IBM followed suit with their PC and Hewlett-Packard LaserJet combination. These systems, produced by both companies, saves users a trip to the typesetter and alleviates the expense associated with typesetting. According to Charp (1986):

> Many industry analysts equate the introduction of the MacIntosh with the beginning of the desktop publishing revolution. With it's windows and icons user interface, the MacIntosh enabled microcomputer users for the first time to mix graphics and text on the same page and show it on the screen. Because text was handled as a special case of graphics, word processing on the MacIntosh began to resemble typesetting, allowing the user to control the typeface and size of words on the page. (p. 34)

Charp (1986) suggested that, "Desktop publishing is not really a single technology so much as it is a synthesis of recent technologies. A typical desktop publishing system includes three components: a personal computer that can combine text and graphics; a low-cost laser printer capable of outputing that combination at near typeset quality; and graphically advanced software" (p. 33).

Desktop publishing is an excellent low cost tool which can be operated by someone trained in word processing. At this level, it offers improved quality over standard printer output and the option of upgrading to enhance quality.

When Apple Computers was developed by Jobs and Wozniak they had no idea of the impact it would have on all our lives. And since IBM joined in the competition with electronic publishing an Appleor IBM compatible microcomputer

affects or is an integral part of virtually every business activity. Boucher (1986) write, "The mergence of Apple's MacIntosh, the LaserWriter, Adobe's PostScript, Aldus' PageMaker and the like, is the latest chapter in that story which is the latest revolution in the typeset word. It is now possible for anyone to purchase a complete desktop publishing system for less than $10,000 (p. 34).

The concept of desktop publishing was established and named by Apple but is being promoted by, and sold in, computer stores nationwide. Many commercial typesetters, in plant, commercial and quick printers are intimidated by electronic publishing. At the same time, authors, publishers, and word processing services feel it is a necessary tool for their business. Electronic publishing is a concept that has been a common practice among major newspapers and publishers for many years, most of which have a large computerized system. At the other end of the nardcopy spectrum, word processing software has brought personal computer power to many mundane writing jobs.

Current Applications

Gancher (1986) stated, "Desktop publishing is a tool first, a skill second. the software and the computer cannot substitute for design skill, for writing talent, or for publishing experience. Placing a powerful design tool in the hands of an untrained worker is not likely to produce the kinds of results that are presented in desktop publishing brochures as typical examples" (p. 43).

Gancher (1986) further stated, "Desktop publishing is still in its infancy; its best is still mediocre compared to professional typesetting, though it is definitely a dramatic improvement on word processing. Desktop publishing is going to revolutionize the way businesses approach print communications" (p. 43).

According to Eda Warren (1987) desktop publishing is best suited to three

types of projects:

1. materials that have previously been produced using typewriters or word processing and printed on dot matrix printers,
2. publications that have repeating formats like newsletters, magazines, and series brochures, and
3. any projects that will require numerous changes in layout as the process unfolds. (p. 48)

Trade associations are doing a phenomenal amount of business with desktop publishing seminars and trade shows. The increase seems to be due, for the most part, to several groups of people: authors, editors, word processing supervisors and office management personnel whose motivation is to learn about something that they may be forced to utilize; entreprenuers investigating a potential opportunity; and sales people and others who were concerned that their job and/or business might be in jeopardy due to the popularity of desktop publishing. Desktop publishing may be considered a threat to people only if they choose to ignore history or fight a new technology with obsolete tools or jump into it without careful evaluation and a suitable business plan.

Needle (1986) observed that, "The real potential of desktop publishing goes beyond corporate newsletters and reports and out to the millions of small business, professional services, and individuals who also stand to gain from having low-cost publishing tools at their fingertips" (p. 113). Michelson (1986) predicted that dramatic growth rate in both systems placements and revenues for the years 1986 through 1990, with the compound annual growth rate expected to be 71% in placements and 50% in revenues (p. 74).

Future Expectations

The current market estimates by CAP International indicate that placements of computer publishing systems will surge from 32,760 in 1985 to 561,390 in 1990. Michelson (1986) reported that, "The market revenues of $503 million in 1985 will increase to an estimated $40.3 billion by 1990. Low-priced desktop publishing systems and software are expected to account for 97% of all computer publishing systems placements in 1990, with revenues expected to reach $929 billion in 1990 -23% of the total market revenue for computer publishing systems in 1990" (p. 74).

A second major expected trend will be in the corporate publishing market. This sector anticipates an increasing level of placements and revenues. Sixty-two percent of all computer publishing systems placed in 1985 were in corporate graphics departments (including printing), technical development and writing groups, and office publishing groups within businesses. These sectors will account for nearly 92% in 1990. Revenues in corporate publishing segments were $160 million in 1985 and are estimated to rise to $2.72 million in 1990.

Michelson (1986) has also suggested that growth in traditional commercial printing and publishing market segments is also expected to continue, although at a slower rate than in corporate publishing segments. In 1985 computer publishing market segments are also expected to continue, although at a slower rate than in corporate publishing segments. In 1985 computer publishing system revenues in the commercial segments accounted for 68% of market revenues, while in 1990 this share is expected to fall to 32.6%. According to Winkler (1986) desktop publishing proponents envision a $6.5 billion market by 1990. That multi-billion dollar amount does not even include revenues that could flow from in-house corporate publishing.

Needle (1986) acknowledged that the new battle for the desktop is onee again between Apple and IBM. Dataquest predicts that by late in 1987, IBM with an estimated $840 million in revenues from desktop systems, will pull ahead of Apple, which is expected to make $705 million from its desktop wares.

Apple's graphics oriented MAC and LaserWriter printer introduced in January 1985 helped the company establish an early lead in the desktop publishing domain. Users of the IBM PC and compatible products have had fewer choices, so what many have done is to jury-rig word processing packages to Hewlett-Packard LaserJet printers to produce newsletters or proposals.

Needle (1986) summarized, "A Dataquest study called 'Nondedicated Publishing Systems' put the total market - software, computers, scanners and printers - at $4.9 billion 1990: $3.5 billion for MS DOS and $1.4 billion for MacIntosh type set ups. That's a quantum leap over 1986 sales of $453 million" (p. 115).

As more and more publishing programs for the IBM PC are introduced, the MAC is slowly, but undeniably releasing it's previously undisputed hold as leader in microcomputer publishing software. Cavuoto (1986) stressed that, "New PC programs rival the MAC products in quality and in what was considered by many exclusive MAC domain - ease of use" (p. 21).

Needle (1986) believes that the real potential of desktop publishing goes beyond corporate newsletters and reports and out to the millions of small business, professional services, and individuals who also stand to gain from having low cost publishing tools at their fingertips.

Summary

Revolutionary techniques began affecting the printing inducstry over 100 years ago. Innovations such as the Linotype, the Teletypesetter, and justifying

typewriter systems all played a significant part in the change which occurred in publication production. Compugraphic introduced phototypesetting which increased inplant printing substantially. The most monumental phenomenon to affect publication production in recent years was the microcomputer. Desktop publishing was brought into existence by the introduction of the laser printer by Apple who also produced a page make-up program that allowed users to combine text and graphics. Desktop publishings greatest potential lies in its use by small businesses, professional services and individuals who require a low-cost publishing tool. Desktop publishing will also have a great impact on the corporate publishing market. The struggle for a lead in this market is between Apple and IBM. Desktop publishing supporters predict that by 1990 the market will exceed $6.5 billion.

CHAPTER III

METHODOLOGY

The purpose of this study was to compare the IBM PC and Apple MacIntosh electronic publishing systems in order to identify a body of knowledge and develop criteria on electronic publishing for evaluation and recommendation purposes.

This chapter describes the methods and procedures utilized in this study. The actual experimentation was divided into two phases. The first phase was conducted to fulfill the following objectives: (1) To identify the operational and functional characteristics that a model electronic publishing system would possess; and (2) To determine which characteristics (operational and functional) were employed by each of the two selected electronic publishing systems. Phase two was to provide a comparative analysis of the cost of purchasing hardware and software necessary for an electronic publishing system.

Sources of Data

Journals and industry and business literature were utilized by the researcher to provide accurate data concerning electronic publishing. The information for the cost analysis was obtained by telephone from those companies whose products were utilized in this study.

Equipment and Materials

The Apple MacIntosh personal computer and the Aldus PageMaker software, along with MacWrite (word processing) and MacDraw (graphics) are one part of

of the apparatus utilized in this study. This conglomeration of hardware and software was compared with IBM's personal computer, the XT, along with Studio Software FrontPage Plus desktop publishing software, WordPerfect (word processing) and Lotus (graphics). Both desktop publishing systems are compatiblewith the Apple LaserWriter printer as output for a hardcopy document.

Two personal computers commonly found in an office/local environment are the IBM PC and the Apple MacIntosh. These types of microcomputers are self-contained units that do not require linking with other systems to perform primary functional. They allow an individual user to perform all functions necessary for preparation of a document (see Figure 3). Although these systems stand alone to function they may be linked by networks and other communication systems. Furthermore, these two systems were most accessible at the University of North Dakota.

The most currently known and used electronic publishing software compatible with these systems are the STudio Software FrontPage Plus for the IBM and the Aldus PageMaker for the MAC. These software packages were also the most accessible to the author at the University of North Dakota.

Method of Gathering and Analyzing Data

The operational and functional characteristics that a model electronic publishing system would possess were obtained through literature search and the documentation that accompanied the software packages. Literature was reviewed to identify which characteristics (operational and functional) were featured in each of the selected electronic publishing systems. The desired characteristics (operational and functional) were placed on tables with the selected electronic

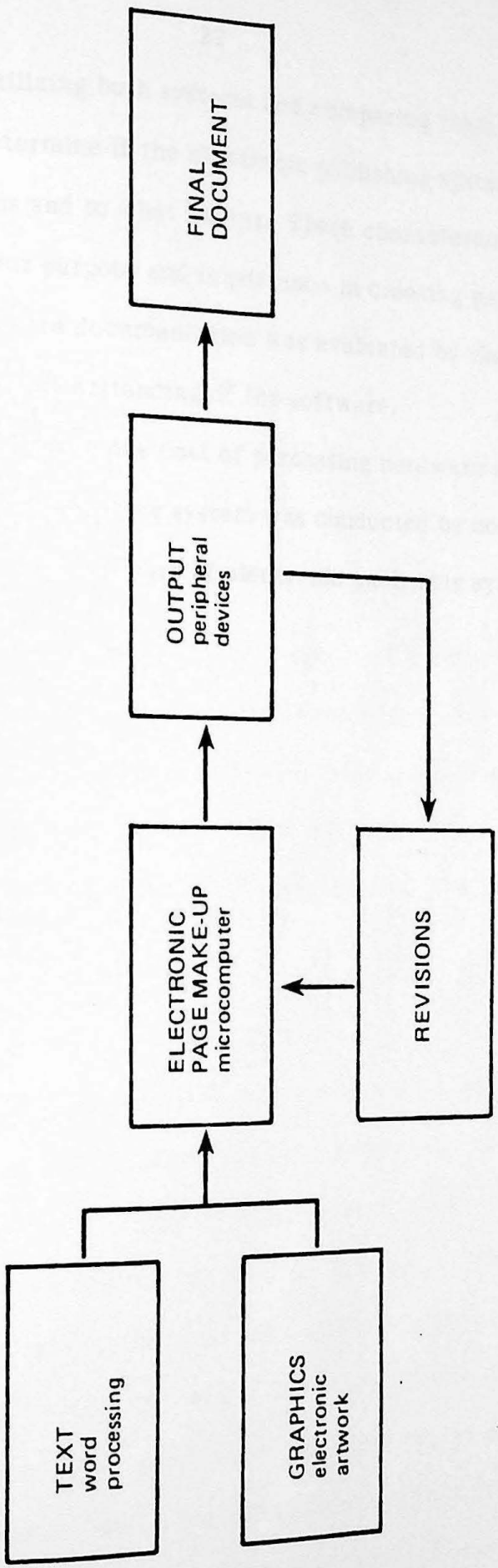

Figure 3: Electronic Publishing Flow Diagram

publishing systems. By utilizing both systems and comparing them with the table, the author was able to determine if the electronic publishing systems possessed the desired characteristics and to what extent. These characteristics were also analyzed in regards to their purpose and importance in creating page layout hard copy document. The software documentation was evaluated by the author based on its ability to provide an understanding of the software.

A comparative analysis of the cost of purchasing hardware and software necessary for an electronic publishing system was conducted by contacting manufacturers of the hardware and software of electronic publishing systems.

CHAPTER IV

ANALYSIS AND PRESENTATION OF DATA

The nature of this study was to compare the IBM PC and Apple MacIntosh electronic publishing systems. The two systems were compared on the basis of operational and functional characteristics and the cost of purchasing an entire electronic publishing system.

Type of Analysis

The data was listed in table form and compared by determining the presence or absence of operational and functional characteristics in each selected electronic publishing system. The characteristics were also compared in regards to their complexity within each system. Numerical data was used to compare the educational and retail cost of each electronic publishing system. The numerical data is presented in the form of tables.

Data Collected for Analysis

The study produced an inventory of operational and functional characteristics from a literature search. The resulting information was the desired characteristics for a model electronic publishing system. To enable the researcher to objectively and systematically analyze the data, a series of tables were prepared to aid in identification of each operational and functional characteristic for the two electronic publishing systems involved in this study. The tables were also utilized to indicate the absence or presence of the listed characteristics for each of the electronic publishing systems. The characteristics were distributed among the tables according to operation and function, this information was then arranged

according to the purpose they served within that particular characteristic.

Operational Characteristics

Table 1 contains the preferred operational characteristics in each electronic publishing system. An operational characteristic involves those peripherals which supports the actual CPU, such as: software (specifically including word processing and graphics), scanners, graphics cards, monitors, typesetters, plotters, and laser printers the desired characteristics of electronic publishing system were broken down into input devices, output devices, hardware, and software. The table indicates whether the characteristics are present or absent in each system.

TABLE 1

Operational Characteristics of an Electronic Publishing System

Operational Characteristics	IBM	MAC
INPUT DEVICES		
Keyboard	x	x
Digitizer	x	x
Scanner	x	x
Mouse	x	x
HARDWARE		
Cards or Boards	x	o
Monitor	x	x
Hard Drive	x	x
Floppy Disk Drive	x	x
SOFTWARE		
Word Processing	x	x
Graphics	x	x
Integration of Existing Software	x	x
OUTPUT		
Laser Printer	x	x
Dot Matrix Printer	x	x
Typesetter	x	x
Plotter	x	x

x indicates presence, o indicates absence

Both systems utilize a keyboard as an input device with the assistance of a mouse. The programs are written in such a manner that the mouse is much more expedient. The scanner can also be used with both systems as an input device. The scanner digitizes artwork into a graphics package and the user migrates the file into the electronic publishing system. Both systems have the ability to utilize a digitizer in the same manner as the scanner.

The two systems have similar capabilities but the MAC designed primarily for graphics which makes it more expedient in regenerating on the screen. The Mac does not require additional cards and boards to use a page make-up program, all the necessary firmware is built into the system. The IBM requires additional firmware to be placed into the CPU. The IBM has recommended requirements necessary for utilization of FonrtPage Plus, as does the PageMaker program. The minimum requirements for the use of PageMaker is 512K but the system will be more efficient if it possesses 1 megabyte of memory. The IBM program must have a main memory of 512 K with 640K recommended, 10 megabytes for the hard drive with 20 megabytes recommended and 1 floppy disk drive. The IBM also requires one 8087 coprocessor and one IBM color card graphics card.

The IBM utilized a color monitor while the MAC only comes equipped wtih a monochrome monitor. The MAC can be used with or without a hard drive, the author utilized one without a hard drive. The use of a hard drive eliminates the need to continually switch floppydisks which are being used in the floppy drive.

Both systems have the capability to utilize existing software. The MAC system can use any software previously produced that is compatible with that computer. The IBM can use and word processing software capable of asynchronous communications and any graphics software generating Hewlett Packard Graphics Language or Metafile formats.

The Apple LaserWriter printer is compatible with both systems and utilzies the Adobe PostScript language. This language translates the data in the page make-up program being sent to the printer. The PostScript laser printer will replicate the graphic data to greater detail than the convertional laser printer. The PostScript language is a chip built into the LaserWriter.

Both systems have the capability to output to a dot matrix printer which would be beneficial for rough drafts and thumbnails sketches of documents. They are able to output to plotters for color rough drafts and typesetters for fine print quality.

Functional Characteristics

Table 2 depicts the typographical aspects desired in the functional characteristics of a model electronic publishing system. Functional characteristics are those special properties builtinto and utilized by the electronic publishing system software to manipulate specific elements in order to enhance the primary operational characteristics.

Table 2 shows only the typographical features present in the functional characteristics of an electronic publishing system. Both systems contain a hyphenation mode. The MAC will hyphenate any words automatically utilizing a dictionary within the program but the user must specify this option.

If the Microsoft word processing program is employed, the option of using a discretionary hyphen is possible. This type of hyphen does not show on the screen unless PageMaker uses it to break a line. However, PageMaker knows the hyphen is there and can use it as needed. ProntPage Plus has a hyphenation logic which, manually, will provide a prompt if it cannot find the word in the dictionary or it will automatically use its logic to split a word. FrontPage Plus also uses logical

TABLE 2

Functional Characteristics of an Electronic Publishing System

Typographical Features	IBM	MAC
Hyphenation	x	x
discretionary	x	x
automatic	x	o
manual	x	x
User expandable exception dictionary	x	o
Kerning		
manual	o	x
automatic	x	o
Tracking control	x	x
Table building	x	x
Automatic bullets	o	x
Tab alignment		
left	x	x
right	x	x
center	x	x
decimal	x	x
Leader tab characters	x	x
Measurement units		
inches	x	x
centimeters	x	x
picas	x	x
points	x	x
fractional points	o	o
Type size range	x	x
Indents	x	x
Leading	x	x
Greeking	x	x
Expanded typeface	x	x
Condensed typeface	x	x
Correct text errors in program	x	x
Text wrap around graphics		
automatic	o	o
manual	x	x
Change column width after text placement	x	x
Copyfitting	x	x
Mixing typestules within a document	x	x
Wordspacing control	x	x

x indicates presence, o indicates absence

hyphenation and places a plus sign at the end of the line to flag each word that was logically hypheated. This lets the individual check hyphenation before output.

FrontPage Plus provides an expandable dictionary for general use and for specialized jobs. This sllows the user to store additional words in the dictionary placing the proper hyphenation for that word. The MAC system does not possess a dictionary which the user can store new words.

FrontPage Plus will automatically kern selected letter pairs and a value identifying the amount of kerning appears in a table, the user has the ability to make changes in this amount, which may be interpreted as manual kerning. Kerning is the elimination of extra space between letter pairs to provide a more aesthetic appearance to copy. The function is especially useful when using a larger type size for theifirst letter in a line of text.

A tracking control defines the letterspacing in the text. FrontPage Plus has several selections to shoos from: normal sets the spacing at a standard width; tights sets the text with slightly less space between each character than the standard width table specifies; touch eliminates almost all of the white space between letters; loose adds a little more space between letters than the width table specifies; and double sets the text with twice as much space between letters as the table specifies. The PagMaker program has only the normal setting for tracking.

PageMaker will produce automatic bullets if they are inserted into the word processing program that has been migrated into the system. FrontPage Plus does not have the ability to place bullets within the text either directly from the program or from a migrated file. Bullets are beneficial for highlighting certain aspects of text to draw attention to those points.

The systems also allow table building by specifying tab settings. Table building is recommended for spread sheet applications and migrated into the page make-up program. Both systems will allow left, right and center tab alignment, they will also allow the use of a decimal increment to set tabs. Provided with the tab functions in both programs is the ability to use leader tab characters which are blank spaces such as those used in a table of contents. The use of tabs will also allow the user to create indents for initial letters. Indents on both systems are possible by specifying tabs.

Both system also provide measurement units in inches, centimeters, picas and points, although they do not allow the use of fractional points which may be important when laying out a document that requires very tight registration.

The type size range is very large for both systems, 4.5 to 216 points with FrontPage and 4 to 127 points for PageMaker. The use of a very large typeface would be undesirable due to the resolution of the ouput device which would render a very poor and unprofessional appearance.

Both systems allow the use of leading, the vertical space between lines of text. The leading is under the same numerical limitation as the type size. The norm for text is 2 points of leading larger than the type size being used. Both system have the capability to manually specify leading and they will also automatically set it 1 to 2 points larger than the specified type size depending on the numerical value of the type.

Greeking is the use of blocks instead of actual type when the page is much smaller on the monitor than its actual size. Both systems employ this feature. This feature is advantafeous for determining overall appearance of a specific page.

Expanded and condensed typefaces are occasionally used in documents for special effects and both systems are capable of utilizing this commodity.

Both programs will allow the user to wrap text around graphics, but it must be done manually. The text will stop filling when it encounters sny type of grphic, but the programs will allow the user to continue to fill space surrounding a graphic image with text.

Correcting errors within the text after the word processing file has been migrated into the page make-up program is possible with both systems although the correction will not be on the original word processing program. This feature is curcial in a page make-up program because it will provide rapid turnaround time necessary for meeting strict time restraints. Column width may be changed in both programs after the text has been placed in that column but there may be discrepancies in the hyphenation of text. This feature is important to have on hand especially if there needs to be text or graphics added into a previously designed page.

FrontPage Plus has a copyfitting function that will automatically place the text in an area and give that text a leading that best fits that space. The user may also specify a maximum and minimum acceptable leading and the program will utilize any number in that range. PageMaker does not provide any copy-fitting features. Copyfitting is sometimess necessary when laying text out within stringent space guidelines.

Both systems have the capability of utilizing as many typefaces as the program employs within one document, although it is unwise to practice this, the general fule is no more than two different typefaces within one document.

Wordspacing control is utilized by both systems when setting the text just-ified. This control is sometimes necessary when justifying copy because text rivers, or white spaces running vertically through the text may occur, a wordspacing control will eliminate this.

Table 3 contains the functional characteristics which dominate the document and page controls. These controls specify the manner in which the text will be treated within a page.

TABLE 3

Functional Characteristics of an Electronic Publishing System

Document and Page Control Features	IBM	MAC
Automatic text flow across pages	o	o
Separate left and right page formats	x	x
Automatic page and section numbering	x	x
Adjustable widow and orphan control	o	o
Column balancing on last page	o	o
Automatic table of content generation	o	o
Automatic footnotes	o	x
Text anchored to graphics	o	o
Multiple numbering styles	x	x
Master page formats	x	x
Snap to guides	x	x
Zoom	x	x
Pages printed as thumbnails	x	x

x indicates presence, o indicates absence

Neither system contains any control which will automatically flow text from the last column of one page onto the first column of the next page. The programs will stop and display a prompt to determine if the program should continue to fill text onto the next page. The text fills in both programs by sections or by paragraphs.

FrontPage Plus provides mirror image left and right page formats with the option of changing any column or layout within any page. PageMaker will provide the same option. This option provides the designer with a consistent layout throughout a document. Automatic page and section numbering is available within both systems which eliminates the possibility of incorrect page numbering

within a document.

Neither system provides an adjustable widow and orphan control. This control would automatically adjust for the placement of a split sentence in two columns at the most ligical place. This option is convenient for serial listing in a document.

Column balancing is not automatically provided with either system, the user must balance columns manually if they so desire. Column balancing provides a consistent margin along the bottom edge of a document.

These systems also do not automatically generate a table of contents although the user may generate one on the word processing package and migrate it into the page make-up program. The user also has the option of generating this minimal amount of text within the page make-up program. Automatic footnotes are not generated by FontPage Plus but are with the PageMaker program.

Text is not automatically anchored to graphics unless it is a caption that was created in the graphics software and migrated into the page make-up program. This characteristic when present would eliminate the possibility of placing an incorrect legend within a graphic element.

Both systems will allow the user to number the documents in a variety of styles, this would be specified on the master format. If the pages were to be numbered in a consistent style, the user has the option of placing the page number individually on each page.

Snap to guides are provided with each program, these guides instruct the program to pull all text and/or graphics flush with the column guideline specified on the master format.

Zooming in to a particular portion of any page is possible with both programs, this is especially useful when placing rules or attempting to set type

in an unusual manner. Along with this characteristic is the opposite effect, in which the programs will output the pages much smaller than normal size, providing a thumnail sketch used by a designer to provide a working model to use as a guide for laying out a document.

Table 4 addresses specific functional characteristics in an electronic publishing system. The table specifies graphics features desired in a page make-up program.

TABLE 4

Functional Characteristics in an Electronic Publishing System

Graphics Features	IBM	MAC
Cropping	x	x
Sizing	x	x
Overlapping elements	x	x
Creating graphics within the program	x	x
Rules		
horizontal	x	x
vertical	x	x
diagonal	x	x
Patterns and shading effects	x	x

x indicates presence, o indicates absence

Both of the selected systems employ a tool which allows the user to trim off a portion of the graphics, horizontally or vertically, that were migrated into the page make-up program. This feature is indispensible for a designer because it provides a means for elimination of undesirable graphic element portions.

Sizing graphics is also possible with both systems. This feature is of great importance because it can stretch a graphics section of the page horizontally or vertically, enlarging or decreasing it in size. This feature also provides the option of sizing only one side or proportionally sizing by altering two sides simultaneously.

Overlapping elements is also a feature employed by both systems. This will allow a user to layer text over graphics within one document.

Both systems allow the user to create graphics within the program. It is possible to generate a freehand drawing, boxes, circles, horizontal, vertical and diagonal rules, and shade areas with various textures.

The documentation provided with the FrontPage Plus software is very poorly written and organized. The tutorial does not provide a logical progression of tasks necessary for producing a printed publication. It does provide a limited explanation for most of the features the program does possess, but does not apply those features to the publication process. The on-line assistance that is built into the program is even less adequate for providing information than the tutorials.

The documentation provided with the PageMaker program is much easier to understand. It provides a logical sequence of steps the user would have to follow in order to produce a printed publication. The on-line documentation provided in the program does not provide the user with any additional information and does not assist the user in solving some problems that may occur.

Comparative Cost Analysis

A comparative analysis of the cost of purchasing hardware and sofware necessary for an electronic publishing system was fulfilled by contacting the manufacturers of the computer hardware and electronic publishing software and inquiring about the educational and retail cost.

Tables 5 and 6 are a compilation of the data collected to fulfill the third objective of this study. The tables show the hardware and software necessary for each system. The IBM system is considerably more expensive than the Mac system in both the educational and retail cost. The retail cost is a great deal

larger than the educational cost for both systems.

TABLE 5

Expenditures for an Electronic Publishing System

IBM/FrontPage Plus System	Retail Cost	Educational Cost
IBM PC XT 640K Fixed disk 20 MB 1 Floppy Drive 2 Serial Ports 1 Parallel Port 1 8087 Coprocessor IBM Color Graphic Card Color Monitor	$ 4,510	$ 2,800
FrontPage Plus Software Package	$ 1,380	$ 1,380
Apple LaserWriter	$ 5,699	$ 3,299
AppleTalk Connectors	$ 140	90
TOTAL	$11,729	$ 7,569

TABLE 6

Expenditures for an Electronic Publishing System

MacIntosh/PageMaker System	Retail Cost	Educational Cost
MacIntosh plus	$ 1,995	$ 1,295
External Floppy	$ 349	$ 279
PageMaker	$ 495	$ 380
Apple LaserWriter	$ 5,699	$ 3,299
AppleTalk Connectors	$ 140	$ 90
TOTAL	$ 8,678	$ 5,343

The MacIntosh based electronic publishing system is considerably less expensive than the IBM based system and although this would be a major consideration for purchasing a system, it is not the most important. The most important aspect to take into consideration when employing an electronic publishing system is whether or not that system can provide the user with adequate results based on guidelines set up by that individual or company. Both the systems contain many of the same characteristics but the IBM system has a more extensive base program with more variations within the same characteristic.

Chapter IV has presented an analysis of the data. Chapter V subsequently presents a summary of the investigation; a discussion of the findings, the conclusions based on the results of the study and recommendations for further research.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

The microcomputer industry is continually changing due to rapid advancements in technology. The industry is frequently being placed in a state of upheaval due to the introduction of more applications for the microcomputer.

One current advancement in microcomputer technology is the introduction of page make-up systems which provide the means for production of documents more rapidly and for a considerable decrease in production expenses.

This study was concerned wtih providing a comparison between IBM and MacIntosh's electronic publishing systems by: (1) identifying a list of operational and functional characteristics for a model electronic publishing system; (2) identifying which characteristics (operational and functional) are featured in each of the selected electronic publishing systems; and (3) providing a comparative analysis of the cost involved in purchasing hardware and software necessary for an electronic publishing system.

Summary

Based on the results of the study, the following summary statements were drawn:

(1) The selected systems possess almost identical operational and functional characteristics in terms of input/output devices and software utilization. The major difference between the two systems lies in the hardware that provides the same utilities

to that system as cards and boards do for the IBM system. The MAC system also had only a monochrome monitor while the IBM system possessed the capability of utilizing a color monitor.

(2) The typographical features contained in the functional characteristics of both systems are similar in presence but the IBM program appears to be capable of utilizing several characteristics to a greater range of purposes than does the MAC program.

(3) The document and page controls contained in the functional characteristics were very similar for both systems. The greatest difference lies in the MAC system which does not provide any prefabricated master page formats but allows the user to create and save them for later use. The IBM system contains 15 prefabricated master pages with the ability to change any of these layouts and save them.

(4) The graphics features contained in the functional characteristics showed no difference between the systems.

(5) The documentation provided with each software package does explain various characteristics employe within each system. The IBM documentation does not provide adequate information regarding how to utilize each characteristic when building a printed document. The documentation and the tutorial in particular are extremely inferior. The tutorial supplied with the IBM system jumps from one portion of publication production

to another outlining what the author assumes the user will feel are important features. The author feels it would be more logical for the tutorial to walk through the production of an entire publication. The potential users will be individuals who are familiar with publication production procedures or those who have never performed such a task. the MAC system also provides documentation and is organized in a more logical manner and provides explanations regarding the use of special features within the software.

Conclusions

A feasible choice for an electronic publishing system initially depend upon the presence of a personal computer in an establishment. If a microcomputer is available both programs would be sufficient to output such documents as newsletters, brochures, and for other publications of this nature. If a given establishment does not currently employ microcomputer usage a decision would need to be made as to what is the most important aspect when adquiring an electronic publishing system. One of the variables to consider is the cost of purchasing a system. The MAC system is the less expensive system but this does not necessarily mean it is the better system. The IBM system, while considerably more expensive, is more powerful than the MAC system in terms of functional and operational characteristics.

The MAC system is easier to learn and the documentatio is much better than what is upplied with the IBM system. Individuals that have knowledge of microcomputers and publication production will find the IBM system more appropriate. Individuals that have little knowledge of microcomputers would

find it more advisable to employ the MAC system because of its more complete documentation at less expense. The MAC system would be most appropriate for an educational environment and utilized an an introductory publication production class.

Recommendations

Based on the results of this investigation, the author's recommendations are:

(1) A study be conducted that would provide a potential user of an electronic publishing system proper progression of tasks involved in prodoucing a publication.

(2) A comparative analysis os operational and functional characteristics between the MacIntosh PageMaker and the IBM compatible PageMaker program.

(3) A comparative analysis of each system employed in this study in terms of what the user actually sees on the screen and how the output actually appears.

(4) An analysis conducted regarding the output in terms of its appearance when printed on a variety of paper weights and textures.

(5) A study be conducted to provide a sample of the output variety and quality available when utilizing an electronic publishing system.

Author's Note

The authore regrets to note that the Studio Software company, producers of the IBM compatible FrontPage Plus software program, are no longer in

operation. The software package does have an independent support service available which was organized after Studio Software ceased to operate.

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