**SOURCE OF FUNDING NUMBER**

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<th>PROGRAM ELEMENT NO.</th>
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**Program**

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**Information**

- Classification: Unclassified/Unlimited

**Date**

- 11/25/87

**Advisory Committee Approval**

- Date: 11/25/87

**Document Number**

- AD-A187 698

**Classification**

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| 2a. SECURITY CLASSIFICATION AUTHORITY | |
| 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE | |
| 3. DISTRIBUTION/AVAILABILITY OF REPORT | Approved for public release; distribution unlimited |
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| 6b. OFFICE SYMBOL (if applicable) | |
| 7a. NAME OF MONITORING ORGANIZATION | Directorate for Computer and Office Automation Resources, Office of the Secretary of Defense |
| 7b. ADDRESS (City, State, and ZIP Code) | Washington, DC |
| 8a. NAME OF FUNDING/SPONSORING ORGANIZATION | |
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| 16. SUPPLEMENTARY NOTATION | |
| 17. COSATI CODES | desktop publishing program review |
| | electronic document delivery optical character recognition |
| | electronic transfer OCR facsimile transfer FAX |
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| 19. ABSTRACT (Continue on reverse if necessary and identify by block number) | |
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| 22a. NAME OF RESPONSIBLE INDIVIDUAL | Randy Bixby |
| 22b. TELEPHONE (Include Area Code) | (202) 274-5367 |
| 22c. OFFICE SYMBOL | DTIC-FB |

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83 APR edition may be used until exhausted. All other editions are obsolete.

**SECURITY CLASSIFICATION OF THIS PAGE**

Unclassified/Unlimited
INSTRUCTIONS FOR PREPARATION OF REPORT—DOCUMENTATION PAGE

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### SPECIFIC BLOCKS

<table>
<thead>
<tr>
<th>Block</th>
<th>Description</th>
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<tr>
<td>Block 1a</td>
<td>Report Security Classification: Designate the highest security classification of the report. (See DoD 5220.1-R, Chapters I, IV, VII, XI, Appendix A.)</td>
</tr>
<tr>
<td>Block 1b</td>
<td>Restricted Marking: Enter the restricted marking or warning notice of the report (e.g., CNWDI, RD, NATO).</td>
</tr>
<tr>
<td>Block 2a</td>
<td>Security Classification Authority: Enter the commonly used markings in accordance with DoD 5200.1-R, Chapter IV, Section 4, paragraph 4-400 and 4-402. Indicate classification authority.</td>
</tr>
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<td>Block 2b</td>
<td>Declassification/Degradation Schedule: Indicate specific date or event for declassification or the notation, “Originating Agency Determination Required” or “OADR.” Also insert (when applicable) downgrade to (e.g., Downgrade to Confidential on 6 July 1983). (See also DoD 5220.22-M, Industrial Security Manual for Safeguarding Classified Information, Appendix II.)</td>
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<tr>
<td>Block 3</td>
<td>Distribution/Availability Statement of Report: Insert the statement as it appears on the report. If a limited distribution statement is used, the reason must be one of those given by DoD Directive 5200.20, Distribution Statements on Technical Documents, as supplemented by the 18 OCT 1983 SECDEF Memo, “Control of Unclassified Technology with Military Application.” The Distribution Statement should provide for the broadest distribution possible within limits of security and controlling office limitations.</td>
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<td>Block 4</td>
<td>Performing Organization Report Number(s): Enter the unique alphanumeric report number(s) assigned by the organization originating or generating the report from its research and whose name appears in Block 6. These numbers should be in accordance with ANSI STD 239 23-74, “American National Standard Technical Report Number.” If the Performing Organization is also the Monitoring Agency, enter the report number in Block 4.</td>
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<tr>
<td>Block 5</td>
<td>Monitoring Organization Report Number(s): Enter the unique alphanumeric report number(s) assigned by the Monitoring Agency. This should be a number assigned by a DoD or other government agency and should be in accordance with ANSI STD 239 23-74. If the Monitoring Agency is the same as the Performing Organization, enter the report number in Block 4 and leave Block 5 blank.</td>
</tr>
<tr>
<td>Block 6a</td>
<td>Name of Performing Organization: For in-house reports, enter the name of the performing activity. For reports prepared under contract or grant, enter the contractor or the grantee who generated the report and identify the appropriate corporate division, school, laboratory, etc., of the author.</td>
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<td>Block 6b</td>
<td>Office Symbol: Enter the office symbol of the Performing Organization.</td>
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<td>Block 6c</td>
<td>Address: Enter the address of the Performing Organization. List city, state, and ZIP code.</td>
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<td>Block 7a</td>
<td>Name of Monitoring Organization: If there is only one performing activity, enter the name of the activity. If there is more than one performing activity, enter the name of the office, group, or committee representing more than one activity, service, or agency.</td>
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<td>Block 7b</td>
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<td>Block 8a</td>
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<td>Block 8b</td>
<td>Office Symbol: Enter the office symbol of the Funding/Sponsoring Organization.</td>
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<td>Block 8c</td>
<td>Address: Enter the address of the Funding/Sponsoring Organization. Include city, state, and ZIP code.</td>
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Block 9. Procurement Instrument Identification Number: For a contractor grantee report, enter the complete contract or grant number(s) under which the work was accomplished. Leave this block blank for in-house reports.

Block 10. Source of Funding: (Program Element, Project, Task Area, and Work Unit Number(s)). These four data elements relate to the DoD budget structure and provide program and/or administrative identification of the source of support for the work being carried on. Enter the program element, project, task area, work unit accession number, or their equivalents which identify the principal source of funding for the work required. These codes may be obtained from the applicable DoD forms such as the DD Form 1498 (Research and Technology Work Unit Summary) or from the fund citation of the funding instrument. If this information is not available to the authoring activity, these blocks should be filled in by the responsible DoD Official designated in Block 22. If the report is funded from multiple sources, identify only the Program Element and the Project, Task Area, and Work Unit Numbers of the principal contributor.

Block 11. Title: Enter the title in Block 11 in initial capital letters exactly as it appears on the report. Titles on all classified reports, whether classified or unclassified, must be immediately followed by the security classification of the title enclosed in parentheses. A report with a classified title should be provided with an unclassified version if it is possible to do so without changing the meaning or obscuring the contents of the report. Use specific, meaningful words that describe the content of the report so that when the title is machine-indexed, the words will contribute useful retrieval terms.

If the report is in a foreign language and the title is given in both English and a foreign language, list the foreign language title first, followed by the English title enclosed in parentheses. If part of the text is in English, list the English title first followed by the foreign language title enclosed in parentheses. If the title is given in more than one foreign language, use a title that reflects the language of the text. If both the English and titles are in a foreign language, the title should be translated, if possible, unless the title is also the name of a foreign periodicity. Transliterations of often used foreign alphabets (see Appendix A of MIL-STD-8474) are available from DTIC in document AD-A080 800.

Block 12. Personal Author(s): Give the complete name(s) of the author(s) in this order: last name, first name, and middle name. In addition list the affiliation of the authors if it differs from that of the performing organization.

List all authors. If the document is a compilation of papers, it may be more useful to list the authors with the titles of their papers as a contents note in the abstract in Block 19. If appropriate, the names of editors and compilers may be entered in this block.

Block 13a. Type of Report: Indicate whether the report is summary, final, annual, progress, interim, etc.

Block 13b. Time Covered: Enter the inclusive dates (year, month, day) of the period covered, such as the life of a contract in a final contractor report.

Block 14. Date of Report: Enter the year, month, and day, or the year and the month the report was issued as shown on the cover.

Block 15. Page Count: Enter the total number of pages in the report that contain information, including cover, preface, table of contents, distribution lists, partial or complete charts, graphs, diagrams, etc. A chart in the body of the report is counted even if it is unnumbered.

Block 16. Supplementary Notation: Enter useful information about the report in hand, such as: "Prepared in cooperation with...", "Translation at (or by)...", "Symposium..." If there are report numbers for the report which are not noted elsewhere on the form (such as internal series numbers or participating organization report numbers) enter in this block.

Block 17. COSATI Codes: This block provides the subject coverage of the report for announcement and distribution purposes. The categories are to be taken from the "COSATI Subject Category List" (DoD Modified), Oct 65, AD-624 000. A copy is available on request to any organization generating reports for DoD. At least one entry is required as follows:

Field - to indicate subject coverage of report.

Group - to indicate greater subject specificity of information in the report.

Sub-Group - if specificity greater than that shown by Group is required, use further designation as the numbers after the period (.) in the Group breakthrough. Use only the designation provided by AD-624 000.

Example: The subject "Solid Rocket Motors" is Field 21, Group 08, Subgroup 2 (page 32, AD-624 000).

Block 18. Subject Terms: These may be descriptors, keywords, posting terms, identifiers, open-ended terms, subject headings, acronyms, code words, or any words or phrases that identify the principal subjects covered in the report, and that conform to standard terminology and are exact enough to be used as subject index entries. Certain acronyms or "buzz words" may be used if they are recognized by specialists in the field and have a potential for becoming accepted terms. "Laser" and "Reverse Osmosis" were once such terms.

If possible, this set of terms should be selected so that the terms individually and as a group will remain UNCLASSIFIED without losing meaning. However, priority must be given to specifying proper subject terms rather than making the set of terms appear "UNCLASSIFIED." Each term on classified reports must be immediately followed by its security classification, enclosed in parentheses.

For reference on standard terminology the "DTIC Retrieval and Indexing Terminology" DRIT-1979, AD-A068 500, and the DoD "Thesaurus of Engineering and Scientific Terms (TEST) 1968, AD-672 000, may be useful.

Block 19. Abstract: The abstract should be a pithy, brief (preferably not to exceed 300 words), factual summary of the most significant information contained in the report. However, since the abstract may be machine-searched, all specific and meaningful words and phrases that express the subject content of the report should be included, even if the word limit is exceeded.

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For further information on preparing abstracts, employing scientific symbols, verbalizing, etc., see paragraphs 2.1(n) and 2.3(b) in MIL-STD-8478.

Block 20. Distribution / Availability of Abstract: This block must be completed for all reports. Check the applicable statement: "Unclassified / Unlimited," "same as report," or, if the report is available to DTIC registered users," DTIC users "

Block 21. Abstract Security Classification: To ensure proper safeguarding of information, this block must be completed for all reports to designate the classification level of the entire abstract. For CLASSIFIED abstracts, each paragraph must be preceded by its security classification code in parentheses.

Block 22a b c. Name, Telephone and Office Symbol of Responsible Individual: Give name, telephone number, and office symbol of DoD person responsible for the accuracy of the completion of this form.
Report On Desktop Publishing

Contract No. MDA903-85-C-0340
Task 43A11

Prepared by:
Advanced Systems Development, Inc.
1701 North Fort Myer Drive, Suite 1101
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and

D.C. Applied Technologies
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Washington, D.C. 20026-3761
OUTLINE

SECTION 1  Background
SECTION 2  Introduction and Methodology
SECTION 3  Elements of Desktop Publishing
  A. Composition Method
  B. Supporting Software
  C. Typesetting Tools
  D. Telecommunications
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SECTION 4  Evaluation
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SECTION 11  Sample information request
Background

In December 1985, Program Analysis and Evaluation (PA&E) tasked Advanced Systems Development, Incorporated (ASD) to assist in the evaluation of electronic delivery of Program Review documents. The evaluation was initiated by Deputy Secretary Taft to more fully integrate the CINCs into the DoD's PPBS. ASD was asked to review the program review process, to evaluate current state-of-the-art equipment, and to propose alternatives with recommendations. After the initial review ASD recommended the most feasible test for the 1986 POM cycle would be to use the USAF Multics system for document preparation and the Worldwide Military Command and Control System (WWMCCS) for distribution of selected program review documents. By memorandum, the Organization of the Joint Chiefs of Staff (OJCS) recommended against the use of WWMCCS for a noncommand and control process. ODPA&E accepted that recommendation.

ASD continued to evaluate options for the near term as well as the long term. During this evaluation ASD was directed to evaluate the use of the Defense Data Network (DDN) communications systems to support the electronic transfer of program review documents. PA&E, working in close coordination with the OJCS Message Center, was able to implement a pilot test for the electronic transmission of selected program review books from the FY 86 program review, July 1986.
The main objective of the test was to verify that technology did exist to support an electronic transfer of program review data to the CINCs. Until this test, no equipment had demonstrated that it could successfully scan program review data into a machine-readable format and then transmit that data to CINC locations where it could be stored on a personal computer (PC) to produce hardcopy reports.

The test configuration included a scanner, PC with high density storage, a secure transmission device, communications media, and a comparable receiving package. A DEST optical character recognition device (OCR) or scanner was connected to a GRID PC with Bubble Memory (GRIDS equivalent of a hard disk). With this system, data was scanned and stored in the PC. The PC was then connected to a STU-II transmission/encryption device and send to three CINC locations, Stuttgart, Germany; Tampa, Florida; Honolulu, Hawaii, using AUTODIN and commercial telephone lines. ASD analysts at these locations received the data through STU-II and GRID PC configurations identical to the system in the Pentagon. The data was received and printed generally without incident except for the problems noted below.

The test results proved that program review data could be successfully scanned and electronically transmitted to CINC locations. It also showed that in order to accommodate charts and graphs, a facsimile transfer (FAX) scanning capability would have
to be employed. The OCR technology would also need an error correction capability to handle characters and symbols not recognized by the scanner. The STU-II encryption device proved to be a major restriction since it would restrict transmission to a point-to-point environment and require transmitting to one CINC at a time. If the program review data was to be transmitted in a meaningful time frame, another solution beside the point-to-point alternative of the STU-II would need to be found. In addition, the use of commercial phone lines employing low speed modems proved to be too slow for the large amount of program review data being transferred.

The three major problem areas that were observed in the test (the scanning of charts and graphs; the point-to-point restriction of the STU-II encryption devices; and the slow data transfer speed) needed to be overcome to take full advantage of the electronic technology available. In August, after reviewing the July test results, PA&E directed ASD to investigate alternatives to the three problem areas and recommend a system that would overcome these problems. ASD provided the requested alternative to PA&E in the November 3, 1986 POM Report. PA&E directed that a final test employing this alternative, which included using the DDN, be conducted and the results provided to PA&E for review. This would provide PA&E with all the needed information to make a final recommendation on the use of electronic systems in the transfer of program review data to the CINCs.
This study was conducted to examine the state-of-the-art of Desktop Publishing Hardware and Software for the final recommendation.
INTRODUCTION

This market survey of microcomputer-based desktop publishing systems, both hardware and software, is intended to provide a basis for making a decision on the advisability of conducting benchmark studies of selected systems, matched against functional requirements specifications. All of the narrative material is introductory in nature, providing only highlights on the nature of desktop publishing, and pointing to elemental observations about the characteristics of the various components. The heart of the study is contained in the appended charts, which identify how completely each component has implemented its function.

A considerable amount of source material was gathered for this study, as evidenced by the list of vendors in the appendix. While the evaluators have attempted to incorporate the latest information available on the subject, the market is so dynamic that, in all likelihood, some recent material has been omitted. However, it is our opinion that there should be little significant impact on timely conclusions drawn from the content of this report.
RESEARCH OF THE CURRENT MARKET PLACE FOR DESKTOP PUBLISHING SYSTEMS WAS CONDUCTED IN THE FOLLOWING MANNER:

1) INFORMATION WAS REQUESTED OF ALL KNOWN VENDORS OF DESKTOP PUBLISHING SOFTWARE AND HARDWARE. A SAMPLE REQUEST IS CONTAINED IN THE APPENDICES.

2) TECHNICAL JOURNALS, BOOKS AND MAGAZINES WERE RESEARCHED FOR REVIEWS AND ARTICLES ON DESKTOP PUBLISHING SYSTEMS.
Composition Method

The What-You-See-Is-What-You-Get approach to desktop publishing displays all fonts and graphics on the display screen exactly as they will appear on the printed page. The compromises that must be made to accomplish this are the obvious: (a) typical screen sizes will not accommodate the size of most printed pages, therefore the display must be scrolled, zoomed, partitioned, or all of the above in order to see the page; (b) display technology cannot satisfactorily present all of the fonts and graphics at an acceptable level of resolution without magnification, therefore some of a full page display must be simulated; and (c) the complexity of page composition in this manner is such that duplication of a given page, varying only the text, as would be the case for a textbook or manual, is very inefficient and time-consuming. On the other hand, the WYSIWYG method provides the ultimate in flexibility in combining graphics and textual material and in the creation of unique and attractive single pages as required for advertising or newsmedia.

The embedded code or batch approach more closely approximates the traditional practice of typesetting, where a text file created with a word processor is modified with
typesetting software and fonts, page formatting characters, and graphics insertions to create the final output copy. Because simple discrete repetitive steps comprise the batch approach, it is more suited to automation than the free-form WYSIWYG method, and thus more efficient in its execution. This method is well suited for preparing multi-page documents such as manuals or books where a format is carried throughout the document, and a revision which ripples through the entire file is accomplished rapidly. As you might expect, the downside of simplicity and efficiency in execution is inflexibility in page composition, and a steeper and more troublesome learning curve as the software does not lend itself to user-friendly interfaces such as mouse pointing devices and pull-down windows and icons.

Supporting Software

All of the typical tools to format documents common to professional quality word processing software are essential for serious publishing applications. These include hyphenation, justification, subscripts, footnotes, and perhaps spelling checkers and automatic generation of tables of contents, appendices, and indexes. Most publishing packages currently do not incorporate the kind of heavy-duty capability that stand-alone text processing software such as Word Perfect, Wordstar, or Multimate have; thus, they may
recommend, and support, the use of separate word processing software to produce the textual material that is imported into the page composition system. Either specific word processing software is supported, and the unique document attribute symbols are incorporated, or translation into a common set of codes or clear ASCII text is recommended. Speed and efficiency are enhanced if the publishing software recognizes the codes of the word processor used, and no translation is necessary. Modifications may be made to the source document and those changes will be reflected in the composition document without intervening procedures. Should only ASCII text files be imported, then no special attributes can be incorporated into the source document, and if the composition software cannot create them, they will not appear in the output product. A special, but not universal, capability in the interface between word-processing document and composition document is that of modifying the composition document on the display and having those modifications reflected in the source document. Without that type of interface, divergent, non-matching documents are a serious possibility.

Another of the related tools that provide a source of input to the page composition process is graphics generation software. Three functionally different systems commonly give the publisher the ability to create original graphic designs and displays: so-called clip-art systems, which incorporate a library of simple, outline drawings of common objects and
symbols, to be included, via a set of utilities, in the composition and modified in any number of ways: paint software, which enables the user to paint designs on the screen using interactive cursor controlling tools such as mouse and joystick devices; and drawing software, similar to painting, but different in the way that mechanical drawings are different from portraiture, including mechanisms and procedures for creating measured and scaled graphics. Again, as in the word processing software, the publishing packages seldom provide the quality of design and execution found in stand-alone systems. Thus, they frequently incorporate interfaces with specific graphics packages such as those from Microsoft and Digital Research, and support the direct import of graphics files created using that software. Logically enough, and unlike the word processing interface, changes made to the composition graphics on the screen will not be reflected back into the source file.

An often forgotten package that has been a mainstay of personal computing is the spreadsheet. Like word processing software, it can be included in an integrated package, but may appear to be "tacked-on", and is often not up to the standards of stand-alone software such as Multiplan, Lotus 1-2-3, and Supercalc. If financial or other information that relies heavily on spreadsheets and charts is to be incorporated in the documents produced, stand-alone spreadsheet software is invaluable. Compatibility requires a
print format output file capability to facilitate importing the spreadsheet document, after which it may be modified with the page-composition software. Changes made to the imported material will not be reflected back to the source file.

Typesetting Tools

Two of the most significant properties of typeset documents that enable the publisher to enhance appearance and readability, and perhaps to emphasize or de-emphasize portions of the document, other than those concerning the appearance of the typeface itself, are those provided by kerning and leading. Kerning can require manual input of commands on the part of the user or be automatic for either selected or all cases. It reduces the space between certain characters such that a part of one may overlap the adjacent character. Each possible combination is unique: the term ligature in traditional typesetting refers to combinations accommodated with a single element of two adjacent characters. Kerning is essential in the production of a high-quality product and produces a significantly more readable document. The time consumed by kerning will be perceptibly greater if it is done in batch mode, following the creation of a whole document unit, rather than automatically, as the composition is accomplished. All automatic formatting and spelling checking is better accomplished if it is interleaved

SECTION 3  PAGE 5
with the much slower process of manual input; processor speed is such that the input will not be perceptibly degraded.

Leading, the term originating with the typesetter's insertion of lead (metallic) strips between rows of type, also does much to accent/de-accent and delineate sections of the document. Varied spacing between rows of type can increase or decrease the speed at which the viewer reads, and thus influence or concentrate the viewer's attention on different aspects of the document. Leading, like kerning, may be automatic or manual, and can measurably affect the overall speed of composition of the product.

The facility with which the composition software automates columnar text and flows it from column to column and page to page will make a significant impact on the time spent on composition. Only a few packages are flexible and powerful enough to manipulate four and more columns and divide the page horizontally into halves or thirds and still carry the theme to multiple pages. Text should also be able to flow around the perimeter of graphic items without manual manipulation. A multipage document represents a continuous process, and should the composer find it necessary to insert or delete sections of text from the body of the document, manually reconstructing the affected balance of the text could be a very tedious task.
Other means of manipulating the appearance of text on the page, such as headers, footers, page numbering, boxes and lines, are all as essential as different fonts, but these are commonly included in most word processing as well as publishing software. The lack of one of these items may simply require that it be done by using some other tool. A singularly invaluable requirement is a "style sheet" or template, to enable the rapid and automatic application of a page format to subsequent pages. The absence or ineffective implementation of this capability, particularly likely in a WYSIWYG package, may mean that the software is not very efficient for documents over a few pages in length. The effect is as if each page were drawn freehand. If the requirement is both graphic, suggesting the WYSIWYG method, and text oriented, emphasizing the batch approach, then the ratio of each to the whole task must be estimated. Employing a WYSIWYG method to create a textbook with limited graphic content is not recommended.

Telecommunications

The complexity of the task of transmitting the output document to a recipient should not be underestimated. The output document, prior to transmission to the output device, i.e., the printer, contains as much formatting information as it does visual content. These formatting codes must be interpreted exactly by the printer to reproduce the document.
accurately. The codes are very specific and unique to the software and printers, and they invariably employ eight-bit binary data to format the output. The primary means of communications for microcomputers is via asynchronous full-duplex telecommunications. In order to accommodate the occurrence of errors in transmission due to common-enough noise on two-wire switched telephone service, software has been developed which incorporates error detection and retransmission. This may be implemented either in the communications software executing on the microcomputer, or in firmware in the data communications device or modem, if used.

Supporting Hardware

Supporting hardware can be grouped into four categories: (1) the processing unit on which the software system will execute; (2) direct access storage devices (DASD) for the storage of system software and data files; (3) the input devices and media to capture text and images; and (4) the output devices for the document file or the printed product. Most publishing software vendors recommend, at the least, an IBM AT-class machine for optimum performance, although most packages will run on IBM XT's or XT compatible computers. Memory in excess of the DOS supported maximum of 640k is not required, although expansion memory beyond 640k that could be employed for memory-resident software such as windows would be
desirable. No specific conditions or reservations about the clock speed of the computer on which the software is executed have been determined.

Almost without fail, a hard disk drive is required to facilitate loading programs and data into memory. Some systems are voluminous in the amount of direct access storage space required, so the effective formatted capacity of MS-DOS disk drives should be noted. For twenty megabyte systems, the capacity available for programs and data may only approach thirteen megabytes, depending on the type of data stored and how closely it approximates cluster sizes. Another factor in disk storage requirements should also be kept in mind; graphic images use an inordinate amount of space; bit mapped images are a primary force for development of high-density optical storage devices. Vector graphics require considerably less storage space than bit-mapped graphics.

The traditional input media for system operation and data capture has been the keyboard; it is rapidly being supplanted for system operation by pointing devices like the mouse, successor to the computer game's joystick. The mouse, a device which, via a transducer, translates motion over a plane surface into CRT cursor position, identifies icons, or picture symbols representing operator actions or action-objects. When the cursor is positioned over the icon, a switch on the mouse is depressed and, combined with the positional data, is
translated into an operator command, or series of commands. The device is also used for painting, drawing, other graphics manipulation, and text modification as well. The device is controlled via either a serial communications port connection or a parallel connection to the processor bus and the appropriate software driver. It greatly facilitates both methods of page composition, and constitutes a critical feature of desktop publishing software.

A recent device for importing graphic information into digital computers is the optical scanner. While digitizers have been around for some time, they have primarily supported traditional ADP applications such as complementing the key-entry function for high-volume transaction driven applications like accounting, by having the originator of the source document manually transcribe the data on paper, forming the characters according to a scanner-recognizable pattern. Current digitizers scan and convert not only text material but graphics as well. Criteria for evaluating input digitizers is much like that for laser printers: quality of reproduction is directly related to the resolution of the device, and speed of operation is proportional to the complexity of the image.
EVALUATION

The charts in the Appendices represent characteristics of the best of the commercial offerings available at this time for IBM-PC compatible microcomputer systems that can be evaluated without a hands-on test of the software and hardware. The existence of what the evaluators consider to be an operational capability is noted, and appropriate Functions are quantified where possible. The charts easily identify software deficient in one or more critical areas, but a critical aspect that cannot be evaluated without using the various systems is speed of operation. The time required for the composition and printing of a document is dependent on the specific characteristics and content of the document itself, i.e., the complexity of the document with respect to both the formatting code of the software and the user interface facility.

The specifications of the hardware must be evaluated carefully against the existing functional requirements. For instance, Pagemaker is not recommended for systems with only a 10 megabyte hard disk (not uncommon for microcomputers until 12 - 18 months ago); little or no working space will remain after system installation. Implementation with the minimum required disk storage will leave minimal room for data especially graphics. The extended memory specification
supported by some ancillary software such as Lotus 1-2-3 is not necessary for this purpose and, indeed, cannot be utilized by most desktop publishing software. Random Access Memory available after loading the publishing software may be put to good use with RAM-resident utilities, although care must be taken to ensure compatibility with other necessary supporting RAM-resident software such as Windows. While non-support for a critical component or capability will adversely affect an evaluation of a package, the component may be provided by separately acquired software. Note that neither Ventura nor Pagemaker utilize the keyboard for cursor manipulation, meaning that a mouse or other pointing device is necessary. Neither Frontpage, PFS, nor Superpage incorporate support for an optical scanning device, but such a capability is available separately. The range of suitable output devices supported by the software seems very narrow at first glance, yet the number of laser printers which can be driven by Adobe Systems' Postscript page description language is quite large. Postscript PDL has quite recently acquired the position of a de facto standard in the industry, and support for it is growing rapidly. There is a wide range of performance among the desktop lasers, even driven by similar software. Considerable differences in printing speed exist also between software packages when measured on identical computers: Pagemaker is markedly slower than Ventura for identical documents and hardware. Twenty four pin printers are still new in the market; as they are quite inexpensive relative to
the lasers, yet generate reproductions similar in quality, especially that of type quality, they are sure to gain rapidly in market share. NEC and Toshiba are leaders in the production of high-quality and high-resolution dot-matrix printers for desk top publishing.

The supported software chart points to an aspect of desktop publishing that bears close scrutiny. The publishing art requires the integration of different disciplines effected by different tools. The concentration of a vendor on a single highly efficient tool may yield a much better product than that from an integrator of tools. At the very least, there exists the opportunity to investigate and evaluate many more alternatives for satisfying specific functional requirements. So, the imported spreadsheet of Pagemaker may well be a better bet in sophistication and efficiency than an integrated spreadsheet capability. Both, however, may better satisfy the requirement than the ASCII interfaces of Deskset, PFS, Superpage, and Scenicwriter. Any special attributes such as highlighting or italics that attend the document will not accompany the ASCII text. All of the listed capabilities are regarded as critical, so software not supporting one or more of them cannot be considered as operationally feasible.

The graphics capabilities listed can generally be provided by many different software tools, and they may be a significant factor in the speed and convenience of page
composition depending on the graphics content. Evaluation of the capability is possible only through hands-on operation as considerable variation exists in the simplicity or complexity of performed functions.

All of the foregoing are the means to the end of document appearance. There is enough variation in the supported capabilities to merit careful evaluation, from universal support for multiple columns to universal non-support for spelling checking. Of critical importance are the size of document supported and the incorporation of a style sheet or template facility, whereby a given format may be carried to subsequent pages. It only seems reasonable to expect the software to support a document of the maximum length the user expects to create; if that is not the case, an output document would be composed of a number of smaller documents. Should the page numbering be inflexible, a user might find it necessary to number the pages of the continued document manually. Likewise, if a formatting template is not implemented, the format for each and every page much be composed, regardless of whether or not it is just like all that preceded it. PFS represents the extreme in page length, but Aldus' Pagemaker has a very finite constraint of 128 pages, easily exceeded by a not too prolific writer. As previously indicated, Pagemaker has no style sheet or template function nor does it automatically continue columns or flow text from one page to another. Some of the formatting tools may be provided by a
word processor (see supporting software), but if a typesetting
tool such as automatic kerning is missing, as it is from Power
and PFS, no reasonable alternative is available. Pagemaker has
an integrated word processing function but does not provide
for wrapping, justification, continuation or indexing. Harvard
also has an integrated word processor, yet does not provide
for footnotes.
CONCLUSION

Based on an examination of the specifications for the data contained in the charts, the evaluators consider a benchmark test, with identification of appropriate functional requirements and measurement criteria, of four of the listed desktop publishing software packages to be necessary before committing to an alternative. Sufficient documentary evidence exists on the insufficiency of the remaining software for one or more critical activities. Ventura, Harvard, Deskset, and Scenicwriter all appear to offer enough sophistication, flexibility, and power, integrated and imported, to warrant an exhaustive test. None of the four incorporate all of the requisite capabilities. Thorough selection and testing of alternative configurations, including supporting software, will result in a composite system yielding greater performance than an integrated package from a single source.

An appropriate system hardware configuration with the requisite minimal capacities and interfaces to support the benchmark study can be determined from equipment specifications, e.g., random access memory capacity, processor speed, display resolution, direct access storage capacity.
printer resolution, input-output interface requirements, etc.
Once the results of the benchmark have been evaluated, the selected software vendor's recommendations on device types and manufacturers should be considered. The software vendors have very specific suggestions, based on extensive testing, for achieving maximum performance and efficiency from their product.
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# List of Vendors

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<td>Borland International</td>
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<td>Boston Computer Society</td>
<td>One Center Plaza Boston, Massachusetts 02108</td>
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<td>BroderBund Software</td>
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<td>Canon USA Printer Division</td>
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<td>CompuCRAFT</td>
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<td>Control C Software Incorporated</td>
<td>6441 South West Canyon Court Portland, Oregon 97221</td>
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<tr>
<td>Cordata Technologies</td>
<td>275 East Hillcrest Drive Thousand Oaks, California 91360</td>
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<tr>
<td>Creighton Development Incorporated</td>
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</table>
Creighton Development
16 Hughes Street
Suite C-106
Irvine, California 92718

Cricket Software
3508 Market Street
Suite 206
Philadelphia, Pennsylvania 19104

Data Transforms Incorporated
616 Washington Street
Denver, Colorado 80203

Datacopy Corporation
1215 Terra Bella Avenue
Mountain View, California 94043

Datalogic USA
Matrix Piz
1964 Westwood Bld325
Los Angeles, California 90025

Dest Corporation
1202 Cadillac Court
Milpitas, California 95035

Digital Marketing
2363 Boulevard Circle
Suite 8
Walnut Creek, California 94595

Digital Research Incorporated
60 Garden Court
Monterey, California 93942

Enterset
410 Townsend Street
San Francisco, California 94107

Epson Corporation
2780 Lomita Boulevard
Torrance, California 90505

Forethought, Incorporated
1973 Landings Drive
Mountain View, California 94043

FTL Systems Incorporated
234 Eglinton Avenue East #205
Toronto, Ontario M4P1KS Canada

Fuji
350 Fifth Avenue
New York, New York 10118

G.O. Graphics
Burlington, Massachusetts

Genicom Corporation
509 West Grace Street
Richmond, Virginia 23220

Graphics Communications Incorporated
200 Fifth Avenue
Waltham, Massachusetts 02254

Hayden Software Company Incorporated
650 Suffolk Street
Lowell, Massachusetts 01854

Heizer Software
5120 Coral Street
Concord, California 94521

Hercules
2550 Ninth Street
Berkeley, California 94710

Hewlett-Packard
11000 Wolfe Road
Cupertino, California 95014

IBM Corporation
Boulder, Colorado

ImageSet Corporation
555 19th Street
San Francisco, California 94107

ImageWorld Incorporated
Post Office Box 10415
Eugene, Oregon 97440

Innovative Data Design Incorporated
1975 Willow Pass Road #8
Concord, California 94520

Insight Development Corporation
2005 Vine Street #4
Berkeley, California 94709

InterLeaf Incorporated
1100 Massachusetts Avenue
Cambridge, Massachusetts 02138
IOMEGA Corporation
1821 West 4000 South
Roy, Utah 84067

IQ Technologies
11811 North East 1st Street
Suite 308
Bellevue, Washington 98005

Kensington Microware Ltd.
251 Park Avenue South
New York, New York 10010

Knowledge Engineering
GPO Box 2139
New York, New York 10116

Koala Technologies
2065 Junction Avenue
San Jose, California 95131

Kodak Corporation
1555 Wilson Boulevard
Arlington, Virginia

Lexisoft
706 5th Street
Davis, California 95616

Lifetree Software Incorporated
411 Pacific Street
Suite 315
Monterey, California 93940

Linguists Software
137 Linden Street
South Hamilton, Massachusetts 01982

Lotus Development Corporation
55 Cambridge Parkway
Cambridge, Massachusetts 02142

Macadam Publishing Incorporated
4700 South West Macadam Avenue
Portland, Oregon 97201

Magna Computer Systems Incorporated
14724 Ventura Boulevard
Sherman Oaks, California 91403

Magnum Software
21115 Devonshire Street #337
Chatsworth, California 91311

Manhattan Graphics Corporation
163 Varick Street
New York, New York 10013

Media Cybernetics Incorporated
8484 Georgia Avenue
Silver Spring, Maryland

Micro Planning Software
235 Montgomery Street
Suite 840
San Francisco, California 94104

MICROGRAFIX Incorporated
1820 Greenville Avenue
Richardson, Texas 75081

MicroPro Intl.
33 San Pablo Avenue
San Rafael, California 94903

Microtek Lab, Incorporated
16901 South Western Avenue
Gardena, California 90247

Microvision Company
38 Montvale Avenue
Stoneham, Massachusetts 02180

Miles Computing Incorporated
21018 Osborne Street
Building 5
Canoga Park, California 91304

Mouse Systems Corporation
2600 San Tomas Expressway
Santa Clara, California 95051

Multimate International Corporation
52 Oakland Avenue North
East Hartford, Connecticut 06108

Mycroft Labs, Incorporated
2615 North Monroe Street
Tallahassee, Florida 32303
GLOSSARY

Typesetting, Layout, and Desktop Publishing

Baseline:

The baseline of a long line of text is the lowermost point of letters, not including descenders (the lower edges of g and j, for instance).

Bitmap:

A graphic image formed by a matrix of dots with a specific number of dots per inch.

Blue pencil:

Traditionally, a line that will not be printed when a page is photographed for offset printing.

Crop:

To trim the edges of a graphic image, thereby removing part of it.

Double-sided:

A publication that will be reproduced on both sides of a sheet of paper. The front side of a page is the odd-numbered side; the back side is the even-numbered side.

Em:

A printer's term for a square unit with the edges equal in size to the point size (height of the line of type). It gets its name from the letter "m", which is usually about as wide as the type size.

Embedded codes:

ASCII codes typed directly into a stream of text to identify type specifications. Usually called "embedded codes" to distinguish them from the invisible formatting codes created by some page composition systems. Embedded codes are especially useful when indicating that only one or two words should be bold or italic within a block of text.
En:

The printer's unit of measurement that is half as wide as the current line size. It gets its name from the width of the letter "n", which is commonly about half as wide as a capital letter is high.

Font:

One complete set of characters in the same typeface and size, including letters, punctuation, and symbols.

Generic Font:

A representation of alphanumerical characters on a screen that may not reflect what the final printed characters will look like.

Kern:

As applied to type, the part of a letter that hangs over and beyond the space normally given to that character (for example, in some type styles the tail of the "y" reaches back under the previous character).

Landscape printing:

The rotation of a page design to print text and graphics horizontally across the 11-inch width of the paper.

Layout:

The arrangement of text and graphics on a page.

Lead:

(pronounced as the name of the metal) The space added between lines of type to provide additional separation. Usually, it is specified in points (each point = approximately 1/72 of an inch or 1/12 of a pica).
Markup:

The process of adding instructions to copy or the actual formats and control-codes to a computer file so some person or machine will format the output in the correct way. Marking up copy used to require a great deal of skill and experience, but it is much easier on interactive systems that immediately show you the results of each instruction on the screen.

Orphans/widows:

The first line of a paragraph is called an orphan when it is separated from the rest of the paragraph by a page break. The last line of a paragraph is called a widow when it is forced onto a new page by a page break and separated from the rest of the paragraph.

Phototypesetting:

Producing a page image on photosensitive paper, as when documents are printed out on a Linotronic 100 or 300 typesetter. This process is sometimes referred to as cold type, to distinguish it from the older method of casting characters, lines, or whole pages in lead, which is called hot type.

Pica:

A printing industry unit of measure, equal to approximately 1/6 of an inch. There are 12 points to a pica.

Point:

A measure of size used in layout and typesetting. One point is equal to 1/12 of a pica, and approximately equal to 1/72 of an inch. It is most often used to indicate the size of type. Typical point sizes would be 10 points for typewriter characters and most text in books, 48 points for everyday newspaper headlines, and down to 6 or 8 points for legal notices and "fine print". Note that most type styles include space between lines and thus letters are not quite as high as their nominal point size.
Portrait printing:

The normal printing orientation for a page: horizontal text on and 8 1/2 inch-wide sheet of paper. See also landscape printing.

Proportional characters:

Characters designed so that some characters, such as "m", take up more horizontal space than others such as "i". Proportional characters pack more information into the same space, are easier to read, and look more like typesetting than do constant-width monospaced fonts.

Resolution:

The number of dots per inch used to represent an alphanumeric character or a graphic image. High-resolution images look smoother and have more dots-per-inch than do low-resolution images. The resolution of images displayed on the screen is usually lower than that of the final laser printout. Laser printers print 300 dots per inch or more; typesetters print 1200 dots per inch or more.

Rules:

Black lines of various styles that can be drawn on a page and set to various thicknesses.

Sans serif:

Typefaces without serifs, such as Helvetica, Avant Garde, and Geneva. See also Serif.

Serif:

Line crossing the main strokes of a letter. Typefaces that have serifs include Times Roman, Courier, New Century Schoolbook, Bookman, Palatino, and New York. See also sans serif.
Style:

One of the variations within one family of typeface, such as roman, bold, italic, outline, and shadow.

Style sheet:

A collection of type specifications and format definitions that can be saved and used in many different documents.

Text wrap:

The ability to wrap text around graphic images on a page layout.

Typeface:

A complete set of characters in a particular design or style. Typefaces come in families of different weights, different point sizes, and different slants.

Weight:

The boldness or thickness of a letter or font.

WYSIWYG:

(pronounced "whizz-ee-wig") An abbreviation for "what you see is what you get", used to describe page makeup systems, displays of pages where you can change the shape and size of columns and pictures and text, and see the results almost instantly on the screen.
Inasmuch as the Apple Macintosh microcomputer and Laserwriter page printer have defined the infancy starting point for the desktop publishing segment of the personal computing industry, International Business Machines may well define the direction and magnitude of its adulthood. The April 2 marketing release of specifications for IBM's Personal System/2 integrated line of microcomputer products, compatible from 8-bit through 32-bit architecture, incorporates the enhanced display and cursor control capabilities which facilitate page composition on CRT screens into the hardware devices themselves. IBM also announced tailored application packages called SolutionPacs which address specific computing requirements. Two such SolutionPacs address publishing applications: the Personal Publishing System executes on the low-end Model 30 and selected 80286-based models and the Publishing System VM Edition operates on IBM System/370 mainframe computers running the VM Operating System. IBM has also embraced the Postscript page description language from Adobe Systems for their proprietary laser page printer. Postscript may likely be the defacto standard that Microsoft DOS is for microcomputer operating systems; Microsoft Windows will also be incorporated into IBM's Personal System/2 family.
The full extent of the proprietary nature of the IBM announcements will probably not be manifest until the new operating systems (developed jointly with Microsoft) and associated applications are released in 1988 and beyond.

DIRECTIONS

Because there are no official standards and only emerging unofficial ones in the desktop publishing market, guesses as to the specific directions it may take are just that guesses. Whatever this report has characterized as ineffective along with specific constraints as to size, speed, and flexibility are those areas which will be resolved first. Integrated packages along the lines of Framework and Symphony, combining the now separate components of word processing, database, spreadsheet, windows, mouse, enhanced graphics display, paint, draw, and support for laser printers and image digitizing devices, should also enter the marketplace in greater numbers. The more sophisticated and better supported software packages such as Ventura Publisher, Harvard, and Scenicwriter, will incorporate the most attractive features of their competition, reducing the disparity in quality among the different vendors. Some packages may, in fact, combine the aspects which we found to most differentiate the existing marketplace: the WYSIWYG page composition and the embedded typesetting code methods. Specific components of the
composition process are being written to be RAM resident, which should significantly speed up some of the more time-consuming processes. Requirements for shared access publishing systems, necessary for large book publishers and the like, can be met effectively through the networking capability of minicomputer-size systems, especially with the decreasing cost of the superminicomputer class, which is infringing on territory previously reserved for mainframes. No appreciable market for publishing software resident on VM mainframes is evident, any more than an appreciable market exists for spreadsheets and wordprocessors on mainframes. These are essentially individual activities, which may benefit from the telecommunication of source material or end products, but would likely be degraded if dependent on shared access to large scale computers.

POSTSCRIPT

Studio Software Corporation, Irvine California, vendors of Frontpage, ceased operations recently citing lack of investor support. Company officials said the maturing desktop publishing industry required more advertising and marketing expenditures than small businesses could afford.
March 10, 1987

Dear Sir/Madam,

Applied DC Technologies is providing an evaluation of desktop publishing software and hardware for a prime contractor to the Office of the Joint Chiefs of Staff, Department of Defense (DOD). Our evaluation report will support the procurement of a number of integrated systems to be installed in DOD facilities around the world.

Please provide the following information, no later than March 26th, so that we may include in our report a detailed analysis of your product:

1) A demonstration copy of your product, if it is available.
2) A copy of the user documentation for your product.
3) Any Technical literature available for your product.
4) Specifications for necessary hardware and/or software interfaces.
5) Recommendations for specific hardware and/or software.
6) Is hardware available as Tempest certified?
7) Government cost for single and multiple unit(s) up to 100.

We have enclosed a return address label for your convenience. If you have any questions concerning our request please don't hesitate to contact us.

Sincerely Yours,

Donald R. Whitcomb Jr.
Director of Research
END

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MARCH, 1988

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