DESKTOP PUBLISHING

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Abstract

Information centres (ICs) cater to a multitude of needs of their users. For quite some time now, ICs are depending heavily on information technology to serve their clientele better, faster and in a professional way. Like CD-ROM and video disc technologies, which are being widely accepted as a part of modern information centres, desktop publishing (DTP) also entered the scene with a bang to provide a professional image to the information services. ICs with their diverse nature of functions can make use of DTP as a tool to enhance the efficiency and effectiveness of document production in information services. This article briefly overviews various aspects of DTP to provide the user an idea about what it is and where the technology can be used.

1. INTRODUCTION

Publishing is the activity that involves selection, preparation and marketing of printed matter. This has grown into a major industry responsible for the dissemination of knowledge. The history of publishing is closely interconnected with two aspects, namely innovations and inventions in the technology, and the inherent desire for social change. Three major inventions (writing, paper and printing) and one social development aspect (literacy) are involved in publishing.

Though book publishing goes back to 3000 BC, when in Egypt papyrus rolls were used as paper to record knowledge, it was the invention of printing which transformed the communication and the laborious writing processes (some of the

Milestones in Publishing

Writing, language	:	From time immemorial
Usage of papyrus	:	3000 BC in Egyp
Paper usage	:	105 AD in China
Wood carving for printing	:	5th century in China
Printing using metal (movable type)	:	Johann Gutenberg (1455)
Typewriter concept	:	Henry Mill (1714)
Lithography	:	Aloys Senefelder (1796)
Iron press invented	:	Beginning of 19th century
Commercial typewriter	:	CL Scholes, Samuel W.Soule & Carlose Glidden (1867)
Offset litho	:	R Barclay (1875)
Linotype composing	:	1885
First generation PTS	:	After Second World War (late 1930s)
Monotype composing	:	1887
Computer as a medium for composing	:	1955
Computer phototypesetting	:	1960 (NLM for Index Medicus)
Word processing	:	1964
Microprocessors/microcomputers	:	Late 1970s
DTP with laser printers	:	Early 1980s

important events in publishing are listed in Box). Breakthroughs in computer technology in the second half of the twentieth century, brought about a new information revolution. The versatility, multifunctionality and the low-cost of computers have penetrated almost all fields of human knowledge: and publishing is no exception to this phenomenon. There is no other event or process or invention that had such an influence on the publishing industry in recent times. Introduced in the late 1970s, the microcomputers became important tools both as input and phototypesetting (PTS) devices, and a publication system. Computers shifted the inputting phase of typesetting from the printer to the author thereby reducing the costs of typesetting, the overall time-lag in publication and at the same time increasing the accuracy of the document. Even distribution of the final copy can be done by making use of computers.

Introduction of laser printers with personal computers (PCs) in the 1980s enabled good quality printed matter at cheaper rates and in a lesser time. This allows the production of all types of documents including figures and graphs, in whatever format one wants. All the matter to be printed can be inputted, edited upto the needed level, formatted and printed with in a short time. And all this can be done from a single place like one's office room, without moving from the computer console.

2. DESKTOP PUBLISHING

The word 'desktop publishing' (DTP) was coined by Paul Brainerd, President of Aldus Corporation, and was introduced on 28 January 1985 at the Apple's Annual Stockholder's Meeting. One of the most important uses of PCs so far has been in DTP. Apart from saving

money, this simple and easy process allows anyone to communicate directly with others without involving any printer or publisher in between.

2.1 What is DTP ?

DTP is a process by which a user (or an author) can produce a full document or camera-ready originals without the need for successive intermediary prepress operations. The main function of DTP is to produce a document on a desktop, that is, in a minimum space environment as compared to the conventional publishing. The concept of DTP originated from a convergence of advances in the computer, information and printing technologies.

A typical DTP system includes a bit-mapped high resolution screen and the WIMP—windows, ikons, mouse and pull-down or pop-up menus—technique. The latter is a graphics-based interface between a user and the operating system of a computer and is a part of most of the DTP systems.

Windows are localised sections within the screen that can be accessed at will and used independently within the main image. *Ikons* are pictograms or symbols (for example, tool box in PageMaker, and box file in Ventura) depicted on the screen indicating possible courses of action. An appropriate ikon can be selected by means of a key, cursor or mouse to initiate a particular action.

A *mouse* is a rolling indicator which can be moved freely around the desktop to control the cursor on the screen. This can be used to select ikons or menus or to select one of the options offered in the menu and to perform other tasks without using a keyboard. *Pull-down* (or *pop-up*) menus are located around the screen and can be pulled on to the screen and opened up by the action of the mouse.

3 COMPONENTS OF A DTP SYSTEM

Any DTP system is a combination of both hardware and software components. The requirement of hardware and software varies depending upon the nature of the document to be published. Factors to be considered while going for a DTP system include: total volume of work, page size, typographic style and quality, graphics (line, halftone, monochrome, colour, etc), and cost.

The following list includes both essential and optional components.

Hardware Components

- Personal computer (workstation)
- Input devices such as keyboard, graphic tablet, light pen, mouse, joystick, scanners, and digitisers
- Output devices such as laser, ink-jet, impact and dot matrix printers, phototypesetters (PTS)
- Storage devices such as floppy, winchester and optical discs, magnetic tapes

Software Components

- Page layout control software such as PageMaker, Ventura Publisher, etc
- Word processing software such as WordStar, MS Word, WordPerfect, etc
- Graphics processing software such as MacDraw, GEMdrasw, etc
- Image processing software to manipulate scanned images (Windows software available for IBM systems and C-Scan and the like for Apple Macintosh)
- Special purpose software for automatic index generation, text extraction from databases, etc and project management software like Mac project

Features of some of the hardware and software components are briefly described below:

3.1 The Hardware

Computer Workstation

These are microcomputers which provide capabilities (matching those of the earlier minicomputers) such as high resolution display on VDU, faster processing, networking and multitasking. Though Apple's Macintosh has been synonymous with DTP, any personal computer, IBM PC-AT or compatible, can be used as a workstation.

Graphic Aids

Figures and illustrations are inseparable parts of any document. The capabilities of the DTP software can be enhanced by the use of peripherals like graphic tablets, light pens, scanners and digitisers to facilitate incorporation of graphics.

Graphic tablet is a flat plate with a fine network of contact points. It is the best way to produce freehand drawing with a computer. When connected to the monitor, the images traced or drawn on the tablet with the help of a pencil or a stylus or a puck are projected on the screen. The projected images can be manipulated in the same manner as other information for integration into the text.

Light pens can be used to draw directly on the screen. As the screen of a computer is vertical, it is very difficult for freehand drawing.

Scanners use two types of technologies, optical (*image scanners*) and video (*digitisers*), for converting an image into computer-readable form. Both transform the continuous tones into a grid of discrete numbers, each representing the shade of gray (gray scale) measured by the scanner for a particular picture element (pixel). Scanners differ in the number of gray levels used to produce an image—from 8 levels to as many as 256. As processing of pictures takes a lot of memory, scanners have to be used in conjunction with mass storage devices.

Image scanners use the optical character recognition technique for transferring the information from a document to the computer. A beam of light is used to read the text as well as the illustrations. A photosensor assigns values on a gray scale depending on the amount of light being reflected from the scanned material and reproduces on the screen. Processing time depends on the quality of scanners and ranges from as less as 20 seconds to as high as 30 minutes per page. The costlier the scanner, the lesser the time it takes for processing an image. In some cases their price is comparable to laser printers. The output quality of the halftone and continuous tone photographs depends on the resolution of the laser printer used. *Scanners* can also be used to transfer printed text into the standard ASCII format usable by word processor for editing. But there are limitations too. The typefaces recognised by a scanner are limited and accuracy varies, calling for a careful checking of the scanned copy. Corrections scribbled with pen or pencil result in confusion.

Though expensive, optical (image) scanners offer easier operation and high resolution over their video (digitisers) counterparts but can only record two-dimensional images while the latter can digitise three-dimensional images.

Digitisers are used to capture photographs. They use a video camera to capture images from a TV or video recorder or laser disc player. The captured

figure can be manipulated with text. The digitising time varies with digitiser to digitiser. The digitised image is stored as a picture composed of pixels. The resolution of digitised image nearly equals to that of a photograph, which can be improved but for the prohibitive cost of the equipment. However, the contrast and brightness of the digitised image can be altered as per the requirements.

Printers

Printing technology is changing at a faster pace. Apart from typesetters, we have laser, dot matrix, ink-jet, daisy wheel, ion-deposition, CRT, thermal-magnetic-optical (electro-erosion), LCS, LED, magnetographic, thermal printing techniques. These were developed at one time or other in the process of developing a cheaper printer or as an alternative to an already existing technique.

A *dot matrix printer*, usually with 90 dpi, can produce acceptable results and in the bit-mapped mode takes 5 minutes or more to print a page. A dot matrix printer can be used for getting page proofs, as usage of laser printers for this purpose is far more expensive. A wide variety of dot matrix printers, now with 240 dpi also, are available in the market which can handle both text and graphics. As they are cheaper than other printers, they are most widely used. They are versatile in providing different styles of print—NLQ, condensed, bold, italic, sans-serif, etc.

Thermal printers contain wires in a 'printer head'. These wires when heated and pressed on a special ribbon, melt the ink on the ribbon and leave an impression on the paper. Some thermal printers heat the ribbon itself. Thermal colour printers use a four-colour ribbon and a special paper. There is one DTP package (Savtek's ETG Integrated Word Processing and Graphics Desktop Publishing System) for IBM PCs which allows the use of *daisy wheels*, but its speed is very slow. *Ink-jet printers* work very quietly and produce same quality as dot matrix printers. They also facilitate colour printing (see March 1992 issue for more details).

Printers based on *liquid crystal shutter* (LCS), and *light emitting diode* (LED) technologies are also available. Though these have fewer moving parts, a single failed LCS or LED causes problems in printing. In the *magnetographic printers*, magnetic charge is written on the drum much the same way as writing heads write on disc drives. The magnetically-charged portions pick up the toner and the image is transferred on to the paper. *Ion-deposition printers* bombard the drum with charged particles instead of light. Here, even a steel drum, which is more durable than the traditional light sensitive selenium drum, can be used but the printer is priced too high. The output quality is lower compared to the laser printer output.

Laser Printers

Laser printers have revolutionised the publishing world by providing near typeset quality of the output. Printing is the weakest part of the DTP both in terms of quality and speed of the output. The quality of output from even the best laser printer was only 300 dpi and was not so good as conventional typesetting where the minimum resolution is 1200 dpi. Now laser printers with resolutions of 1000-1200 dpi and imagesetters with higher resolutions are available. In the near future, this may further improve and the laser printer output quality may match with that of typesetters.

Laser printers are page printers which print one page at a time. The advent of

laser printers in 1985 made the DTP systems a run away success. There are several brands and makes. Laser printers work on the same principle as xerox machines. The image is created by a raster image processor (RIP). This is transferred by a laser beam to a photosensitive drum, which gets charged wherever the laser beam touches it. When the charged drum comes into contact with an electrostatic toner, the toner particles are adhered to the charged portions of the drum creating the image. When the paper passes under the drum, the image is finally transferred on to the paper which gets fixed when the paper passes through the heat rollers. A laser printer needs about one Mbyte memory to process an A4 size page of graphics. An additional 1.5 Mbyte is needed for the manipulation of fonts and typefaces. The type size in many laser printers vary from 4 points to 72 points, although a few can print upto 720 points (10 inches hight).

Over the years, there has been a tremendous improvement in terms of the output quality (300-1200 dpi), verstality (from text to a combination of text and graphics), speed (from a few minutes for a page to a few pages per minute), and the most important, (cheaper day by day). The fastest laser printer can manage around 15 pages per minute which may be too slow to publish a long document. If the pages contain graphics, the speed comes down further. When multiple copies of the publication are needed, one has to link the laser printer to a xeroxing machine. There is one laser printer—Canon—which also can be used as a duplicating machine. Alternately, the computer can be linked directly to a PTS machine. Software like PageMaker and Ventura Publisher can drive typesetting machines like Linotronics 100 or 300 with resolutions of 1270 and 2540 dpi, respectively. All DTP software compatible with PostScript can be linked to typesetters. Due to the rapid advances in the laser printer technology, refinements in resolution, and the falling prices, it is very unlikely that any other printer technology would shadow laser printers.

Page Description Languages

Laser printers and typesetters achieve excellent results when they are driven by a page description language (PDL), of which PostScript is the best example. A PDL receives instructions from an application (say, word processing or page make-up) and generates a stream of bits that controls the imaging mechanism of a printer. It is the most critical component of a printing system. PDLs accurately define the arrangement of the text and other graphic elements on the final printed page. These translate some or all of the text and figures including halftones into a common language for outputting as a page image. All the elements are recorded digitally. This information is then used to instruct the output device which may be a laser printer or a PTS. As the PDL translated (PostScript) files are encoded simply as ASCII character strings, these can be transmitted over the telephone lines in a network or through electronic mail. There is a wide variation in the abilities of PDLs in handling text, graphics, halftone images, character sizes, orientation, etc. Many languages are device independent (for example, PostScript). They run on a variety of printers of different manufacturers. Due to its licensing to a variety of manufacturers PostScript, undoubtedly the leading PDL in the world, allows anyone to combine

and match the best software and hardware for any type of needs.

Examples of PDLs include Interpress, DDL, HP Printer Command Language, Laser Graphics Package, imPRESS, etc.

3.2 The Software

DTP Software

The software used in DTP should be flexible, user-friendly and easy to use. An ideal DTP software should combine most of the facilities of a word processor with those of a good graphics program. True DTP software includes WYSIWYG (what you see is what you get) display, the ability to mix text with graphics (both colour, and black and white), and better control of page layout with typographical capabilities. The final layout of the pages on the screen should resemble the printed page. Many software are not strictly WYSIWYG because of a number of windows to be used at a time. The size of the screen does not match the standard A4 sheet. This can be overcome by having an enlarged view of the text. DTP packages allow users, designers and artists a flexibility for layout purposes.

An ideal DTP program should have compatibility with all dot matrix and laser printers and also with PostScript so that it could easily be linked with typesetters. In addition, like a word processor, it should also have text editing facility to accommodate last minute changes; search and replace capability; cut and paste; delete, copy and automatic page numbering; facilities to create automatic folios; and indexing capabilities. While formatting text, the program should allow the text to be centred and allow margins on four sides, automatic hyphenation and to run text around graphics, etc. The program should also contain decorative features such as outlines, borders, geometric shapes, spraying with airbrush, etc which can be added as and when needed.

Page Layout

The number of photographs, tables, charts, graphs and their precise position makes the page layout/make-up work an important aspect in the publication process. The size of figures, number of columns, and format, are interdependent. The post-proof-reading processes, (incorporation of the corrections and changes) need recomposing and repaste-up. In conventional publishing, not only these steps are inevitable and involve large time schedules, but also result in a poor quality camera-ready copy.

Page layout programs of a DTP system relate to the arrangement of text matter on a page. Different aspects of page layout are predefined using a style sheet which is in-built in the DTP system. Using the style sheet one can choose the typeface and size, number of lines and columns per page, bordering, running titles, pagination and location of page numbers, etc. Rules for hyphenation, justification, margins on four sides, interline spacing and even spelling may be included in a style sheet. The edited text from the word processed files is then imported into the page layout format. Using the mouse in conjunction with tool box or box file, the headings and other decorative features can be marked. Using the style sheet the text is brought to the desired format.

PageMaker, Ventura Publisher, Fleet Street Publisher, Harvard Professional Publisher, GEM Desktop Publisher, PFS Click Art, Page Setter, Publisher 1000, Ready Set Go, Stop Press, Typesetter, City Desk, Spellbinder Desktop Publisher, Front Page, Just Text, TeX, PageWriter, Fontasy, XPress, etc are only a

few of the DTP software available in the market. DTP is such a dynamic field that new packages and systems or new versions of older packages with enhanced capabilities and features are continuouslyl being developed. The trend is to develop more user-friendly packages easier to use and provide basic facilities at a lower cost.

Word Processing

Text is usually prepared using a standard word processing package. The word processing software have a lot of capabilities which can be exploited here. The keyed in text can be edited, modified and then is stored in ordinary text files. Usually the keyed in text should not include mark-up or printing effect codes (such as underscore, bold, etc) as these become superfluous in DTP.

A few of the available packages are: Byline, Display Write, IBM Writing Assistant, Interleaf TPS, Laser Author, Lotus Manuscript, Mac Author, MicroSoft Word, MultiMate, Page Perfect, PFS, Samna, Spellbinder, Total Word, Volkswriter, Word Perfect, WordStar, XyWrite, etc. Many of these are regularly updated and have in-built DTP features.

Graphics Software

The graphics software falls into a number of categories. These include *structured (geometric) image software* based on standardised shapes and patterns which can be initiated by the cursor, plotted figurations or stored reference diagrams; *business graphics software* which are concerned with graphs, bar and pie charts, line diagrams, etc; and *freehand graphics software* which allow the user to draw diagrams as per the need. by either drawing (outlining) using a graphic aid or painting using electronic paint brushes, tints, stipples or airbrush patterns. Graphics can be generated using any of the standard drawing packages and can be imported in the document.

Graphics software include MacDraw, MacPaint, Corel Draw, Click Effects, Full Paint, Cricket Draw, GEM Paint, GEM Draw, GEM Graph, Chart 3.0, DR Draw, DR Graph, etc. A few of these also have CAD capabilities.

3.3 Fonts

A font is a matrix from which the typefaces, a set of characters that share a common design distinct from other sets, are generated. Typefaces are available in different shapes (for example, regular, light, condensed, expanded, outline, religious and so on) and sizes. There are hundreds of fonts and an equal number of typefaces available in the publishing industry. But a few typefaces such as Times, Universe, Helvitica, Courier, Avant-Garde, Bookman, Century School Book, ITC, etc are more widely used. A variety of fonts in different styles and sizes are offered by DTP software. Styles include bold, italic, bold-italic, extralarge, shadow, script, and so on. A library of fonts is designed to go with a particular DTP system. A few are compatible to more than one system.

4. DTP vs CONVENTIONAL PUBLISHING

Conventional publishing process involves many steps. Each is a tedious process in itself. Composing, whether manual or mechanical, takes a big chunk of the total time involved. Page layout and make-up is an other important step which need the attention and interaction of the publisher with the printer.

For low-volume jobs DTP systems offer substantial cost advantages. If the requirement is a few number of copies,

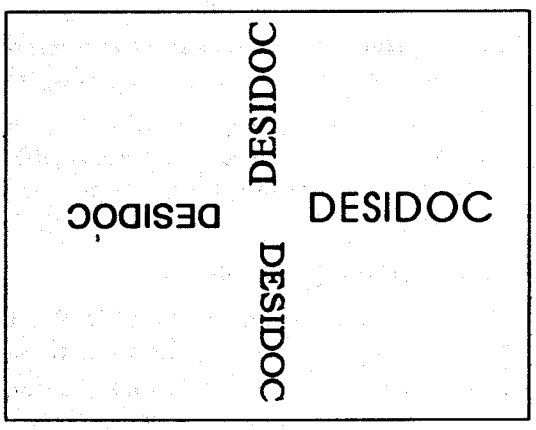
you can run them off directly instead of printing them.

And for most common applications, the DTP offers a level of printing quality that's practically as good as conventional typesetting. Except in cases of art-books or other specialised high resolution needs, you'll hardly be able to tell the difference. The scope of DTP is quite broad and may range from internal house memoranda to complete newsletters, journals or books.

4.1 Advantages

DTP offers a number of advantages, which include

- Less time required when compared to traditional publishing
- Projects a more professional image—usually at less cost
- Production time can be reduced
- Security of printed material (say, confidential material) can be improved
- Publication standards can be maintained using a house style and style manual which can be stored
- Run-around time is almost nil
- On screen editing and alterations are facilitated
- Changes even at the eleventh hour can be carried without loosing quality and problems of repaste-up of the artwork
- Visual aids (overhead transparencies, diazo slides) can also be prepared
- Considerable number of copies can be printed in a short time (laser printers can give 8-15 copies per minute)
- Combining text and graphics is easy
- Flexibility and ease of production
- Improved quality and resolution can be achieved
- External typesetting, layout and proof-reading are avoided resulting in material, manpower, and money savings



Text rotation using DTP

- Graphs, charts and even photographs in halftone can be incorporated easily with the help of scanners
- Ability to design a format and correct it if needed at the place of work itself
- More economical in the long run
- Different font systems and types can be used as and when desired, which is very tedious and expensive in conventional system
- Spelling checks can be done using special software such as spellstar, speller checker, etc
- Minimum redundancy can be achieved as up-to-date information can be maintained.

4.2 Limitations

DTP can be a fast, efficient, flexible and economical way of small-scale publication, but it has some limitations which include

- The output is not of high quality
- Formal training is required for better results

- High initial cost
- Should be supported by packages for word processing, typography, drawings
- Not economical for bulk printing
- Size is maximum to A4 size (with a few exceptions where A3 size is possible)
- Mathematical equations, complex tables and too many photographic images are difficult and time consuming

5. APPLICATIONS OF DTP

Most common applications of DTP are production of reports, newsletters, leaflets. Others such as books, forms, covers reports, questionnaires also are designed/prepared using DTP. However, the technology is cost-effective only when the number of copies made is limited (i.e., in-house, restricted use). However now it is a common practice that camera-ready copy (final copy after proof-reading) is being made using a DTP and the copy is used to make negatives and processed for multi-copy printing. Alternately, clubbed with photocopying machines (xeroxing) fairly large number of copies can be made. DTP applications include

- Reports and presentation material
- Minutes of meetings, memos
- Price lists, datasheets, part lists
- Newsletters, bulletins, etc
- Manuals, user guides
- Journals
- Sales aids
- Trade catalogues
- Books and booklets
- Art work/layouts of advertisements
- Annual reports
- In-house publications
- Forms, pamphlets, handouts
- Charts, designs, and so on.

In library and information centre environment DTP can be used to generate in-house publications like CAS, SDI, annual reports, bibliographies, state-of-the-art/trend reports, forms, guides, notices, etc and any other hard copy publication can be brought out. Camera-ready copies of the publication can be produced using DTP which later can be duplicated as per the requirement.

6. CONCLUSION

DTP makes available all types of publishing possibilities to all sorts of people. It makes possible the existence of small publishing setup and allows the originator of the material to communicate with the readers directly. DTP is an excellent medium of publishing with ease of use; versatility and flexibility for manipulations; cost, material and money savings. Anyone can become his or her own writer cum printer cum publisher. It allows one to be creative. As the DTP technology is always improving and the prices of the hardware and software are going down in the near future instant print shops may install laser printers in the same way as xeroxing machines. For those who want to save time, manhours of typesetting on letter presses, making galleys, artwork, proof-reading, cumbersome paste-up jobs on page proofs and having them read, and finally getting a quality publication, the DTP is the best alternative.