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Getting Graphic: Influences of the Graphical User Interface on the Design of Instructional Texts

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About a decade ago David H. Jonassen, editor of *The Technology of Text: Principles for Structuring, Designing, and Displaying Text*, remarked, "In a decade or so, the book as we know it will be as obsolete as is movable type today" (379). This comment, appearing in the introduction to the "Electronic Text" section of the Jonassen book, can be taken as either astutely prophetic or hopelessly misguided, depending on one's point of view.[1] While even a cursory inspection of the shelves of any bookstore would seem to refute Jonassen's claim, a visit to the nearest software retailer would just as likely confirm the view that electronic media indeed threaten to displace the hegemony of print. Regardless of the accuracy of Jonassen's prediction, however, his statement points up a common thread in discussions among theorists of electronic text: the tendency to view print and electronic media as successive stages in a kind of linear, sequential evolution in which electronic text is ultimately destined to supersede print altogether. Among these theorists the implication frequently appears that books are static, unchanging artifacts whose inability to respond to technological change signals their imminent extinction. Contradicting this view, however, is the fact that the development of electronic text has occurred alongside a substantial increase in the print output of the publishing industry. While some theorists have seen this as further evidence of the moribund condition of the print medium—a final burst of energy before the inevitable collapse[2]—the actual response of print publishing to the emergence of new media suggests another scenario. In place of the linear model of technological change, in which each innovation supplants a previous one, this paper proposes a model of co-evolution, in which electronic and print media develop concurrently. By examining

recent trends in the evolution of print and electronic texts, this paper will investigate the mutual influences between the two media and explore the evolutionary relationship between electronic text and book technology.

Narrowing the field

The relationship between books and electronic text is a complex one, and it is therefore essential to avoid the temptation to oversimplify the situation. Conflating the myriad products of book technology into a single entity called "Print" and reducing the various examples of electronic text to a single category such as "Hypertext" would inevitability lead to generalizations of the most errant kind. In order to sidestep this snare, I will focus on a particular genre of texts that occurs in both electronic and print formats: instructional texts. There are several reasons for concentrating on instructional texts. To begin with, instructional texts tend to be more complex in structure and appearance than continuous prose genres and therefore require greater attention to design and presentation (Hartley 7). In addition, instructional text is particularly well suited to presentation in electronic media and is already well established in computer-based formats. More importantly, the fact that instructional text has migrated so easily to the computer has posed a special challenge to the corresponding sector of the book industry, spurring a heightened level of experimentation and innovation. Finally, the mutual influences of these two media will be most easy to gauge where they overlap. Instructional text therefore provides a favorable ground on which to assess the magnitude and direction of these influences.

As particular case histories in this endeavor, I propose a comparison of software environments with corresponding print-based texts that have the goal of providing reference and tutorial information to help people learn to use particular applications within these environments. Several factors contribute to the advanced pace of innovation and evolutionary development in such texts. For example, these types of books tend to have computer-literate audiences, and the expectations of these audiences, including those of beginning computer users, tend to be different from the expectations of audiences of general texts. (These expectations will be developed in detail throughout this paper.) Another factor that contributes to the high rate of evolutionary development is the abbreviated shelf life of these texts. A computer book covering a particular software application becomes obsolete (as does the software itself) as soon as that product is released in a new version. Since the primary vendors of commercial

end-user applications tend towards upgrade cycles of between eighteen months and two years, publishers can count on a degree of planned obsolescence that gives them greater license to experiment with alternative structures and designs. Finally, computer books presuppose readers or users who are not highly motivated to read progressively through the text. The goal of these readers usually is to dip in, get what they want, and get out again as quickly as possible. Therefore, in order to catch the readers' attention and draw them in, the designs of these texts need to be more "obtrusive" than, for instance, the design of a novel or a collection of essays.

Typographical cues and spatial cues

In discussing the differences between on-screen texts and texts in book format, one should establish a vocabulary of terms with which to describe and analyze structural and visual formats. One useful distinction is that between *typographical cues* and *spatial cues*.[3] Typographical cues include such features as typeface, size of type, and color, while spatial cues include blocking or "chunking" of text into paragraphs, arrangement of text into lists or columns, the determination of line lengths, and the use of indenting to indicate paragraph divisions. Both typographical cues and spatial cues function as signals to the reader, providing a level of visual semantic meaning that supplements the purely lexical meaning of the words on the page or on the screen.

Surface and interface

A particularly useful functional distinction for the discussion at hand is that between *surface* and *interface*, a distinction elaborated by Stephen T. Kerr in his article "Instructional Text: The Transition from Page to Screen." The surface structure of a text comprises that part of the text that is visible to the reader or user at any given moment. In a book, this is usually equivalent to a two-page spread, although in certain constructions, for example, some spiral-bound volumes, surface structure may consist of a single page. In a computer-based text, surface structure generally comprises a single screenful of information. In both print-based and electronic formats, surface structure includes typography, layout, illustrations, and quality of language, as well as the user's subjective reaction to these elements (Kerr 368).

In contrast to surface structure, interface refers to the entire system or global structure surrounding the text that gives the user access to any other location within the text that she or he may wish to reach. As Kerr notes, interface structure is closely tied to the problem of *wayfinding*, or naviga-

tion within and among texts. Kerr divides wayfinding or navigational aids into three levels: immediate, internal, and external. The *immediate* structure of the text refers to information at page-level or screen-level. In a book, wayfinding devices at the immediate level include the use of different levels of headings and the spatial organization of elements on the page—for example, the arrangement of text into paragraphs and the placement of illustrations within frames or figure boxes.

On a computer screen, immediate-level wayfinding aids include those named above as well as features such as the status line at the bottom of an application window and the "elevator box" (located on the scroll bar) that indicates the position of the user's cursor within an open document. The *internal* structure of a text includes wayfinding devices found within a single document. A text in book format, for example, might include page numbers, cross references, a table of contents, an index, and other internal guides to the text. A computer application might include scroll bars, menus, and toolbars, as well as navigational commands such as "Go To" and "Find". Finally, the *external* structure of a text includes system-wide wayfinding features—for example, card catalogs and bibliographies for print-based texts, multitasking capabilities, file management features, and program management utilities for electronic texts.

The following sections will employ the concepts of surface and interface structure to highlight the salient points of intersection in the simultaneous evolution of computer-based and print-based instructional texts.

Character-based applications

Surface Structure

Today it is common for theorists of electronic text to extol the graphic capabilities of the computer while deploring the visual poverty of the printed book. In *Hypertext: The Convergence of Contemporary Critical Theory and Technology*, George P. Landow acknowledges that printed texts utilize more visual elements than we tend to think about, but then proceeds to bemoan what he perceives as an unwarranted prejudice on the part of the publishing industry against the inclusion of "visual information" in printed texts (49-51). In a similar vein, Myron C. Tuman laments the unadorned aspect of print-based literature, exemplified by the Modern Library series which consists of "entire books whose graphic component is represented by an illustrated cover and a torch-beating [sic] colophon on the title page" (111). Observations such as these are so narrowly

focused on a particular type of book that they ignore the vast array of highly "visual" books that flood the market each year. While these graphically-oriented books tend not to be "literary" (and therefore do not fall within the purview of literary critics like Landow and Tuman), it is a mistake to correlate the perceived dearth of graphic elements in printed texts with an inherent deficiency of the print medium itself. One need only consider the remarkable visual designs that have evolved in print genres such as the "coffee table book" and the illustrated children's book to realize that the printed text is capable of an impressive degree of graphic sophistication.

Although computer-based texts are now routinely considered to be graphically superior to printed books, few would have drawn this conclusion prior to the introduction and wide-spread implementation of graphical user interfaces (GUIs). Compared to the old character-based programs, such as those running under DOS, traditional books were much better at exploiting surface design features, including graphics of all varieties. While character-based environments offered only limited options for spatial and typographical cueing, books afforded a wealth of possibilities for the design of the surface structure. This is not to say, however, that publishers fully exploited these possibilities. Figure one, for example, shows a spread from the 1990 book *Mastering WordPerfect5.1*. This book appeared after the introduction of *Windows 2.0* but before the release of a *Windows* version of *WordPerfect*. Therefore, readers of *Mastering WordPerfect 5.1* would have been using the book alongside a character-based application with a fairly unremarkable display, a fact that is mirrored in the visual design of the book itself.

As illustrated in Figure 1, Mastering WordPerfect 5.1 has a very traditional layout that resembles the format of conservatively designed academic textbooks. It consists almost entirely of verbal information presented in conventional paragraph format, and the relatively few illustrations it contains are literal depictions (captures) of the character-based screens within the *WordPerfect* application. These illustrations bear traditionally placed captions, while callouts or labels that help readers integrate textual and graphic information are used only rarely. The text is highly linear, with a clearly structured hierarchy cued by various levels of subheads, and it contains no sidebars or other significant interruptions of the text to distract the reader from a sequential, linear approach to the material. The book does employ marginal notes, but these tend to be brief, infrequent, and visually unobtrusive. These particular examples suggest that while the book format offers a great potential for imaginative and informative graphic displays, this book—typical of DOS-based instruc-

tional texts—eschews visual experimentation and innovation in favor of a conservative text-oriented design that reflects the surface appearance of the product it covers.
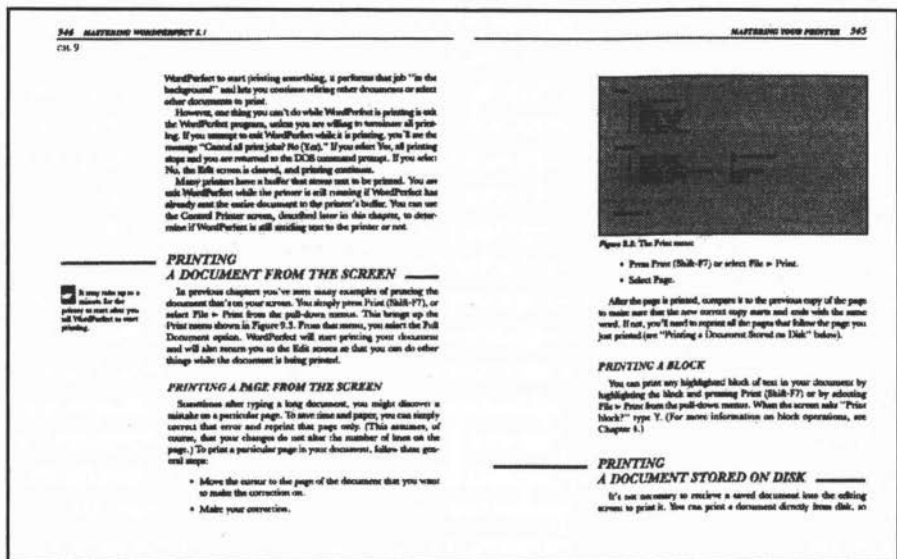

Figure 1. Layout based on DOS-based surface.

Interface structure

In contrast to the unimpressive surface structures of character-based programs, the interface structure of these programs far surpassed anything available in print. Computer applications uniformly offer superior indexing, cross-referencing, and linking capabilities which allow the user to jump from one item of information to another instantaneously. The on-line help system available in *WordPerfect 5.1*, for example, provided users with descriptions of function keys and an alphabetical list of features at the press of a key, as well as context-sensitive help which gave users instant access to information about whatever feature they were using when they summoned on-line help. In addition, the application offered users alternative ways to access help: they could use either function keys or pull-down menus.

Clearly, the printed book is incapable of matching the speed, flexibility, and linking capacities of the computer. Nevertheless, an examination of

the immediate and internal interface structure of *Mastering WordPerfect 5.1* suggests that its publisher was not only conscious of the wayfinding problem but anxious to improve upon the standard navigational aids typically provided in printed books. *Mastering WordPerfect 5.1* includes two tables of contents: an abbreviated one-page "Contents at a Glance," which lists only part titles, chapter titles, and the appendixes, plus a 25-page table of contents that lists all first- and second-level subheads in addition to the information contained in the "Contents at a Glance." The indexing of the book is significantly more elaborate than the indexing of the mass of nonfiction books on the market: in addition to a highly detailed two-column, 29-page index at the back of the book, *Mastering WordPerfect 5.1* contains a two-page summary index to key points and procedures at the beginning of each chapter. These "Fast Track" indexes employ a second color to cue readers to the key opening phrase of each entry as well as to the corresponding page number. Additional indexing of features, procedures, and page numbers is provided on the front and back endpapers, and many of the marginal notes contain cross-references to other sections of the book. Finally, the book includes a pull-out reference card displaying function keys and menus—an external wayfinding aid that helps users navigate not the book but the *WordPerfect* application itself. While no print-based text can successfully compete with electronic texts in the area of wayfinding techniques, *Mastering WordPerfect 5.1* is an example of a text which attempts to compensate by offering readers many alternative features to assist in navigating, both within the text and within the corresponding computer application.

The Graphical User Interface

Surface Structure

As software vendors put their backing behind various types of graphical user interfaces, their applications acquired much more elaborate provisions for typographical, spatial, and graphic cueing. Furthermore, as GUIs increased in popularity, it became clear that the "look and feel" of these graphically-oriented operating environments was being reflected in the design of computer books.

Figure two shows a spread from *QuarkXPress3.1 by Example*, a representative example of an instructional text in which the book's surface structure mirrors the surface structure of the graphically-oriented application it addresses. In this text the layout is much livelier than that of the

DOS-based book illustrated in Figure 1. It has abundant illustrations, the body text is in a larger, less formal typeface, and the page design uses white space more liberally, giving the overall text a "friendly," open feel. The figures are highly graphic, in contrast to the text-based screens reproduced in *Mastering WordPerfect 5.1*, and the illustrations are no longer confined to the space defined by the text area of the page. The graphic components of the book have migrated into the margins, contributing to non-linear approaches to the material, and they are occasionally displayed with text flowing around them in a way that helps to integrate text and image. This integration of text and image is reinforced in figures that contain callouts or labels. The margins function as a kind of pasteboard for displaying graphics, including icons—a graphic element used with increasing frequency in various types of software applications. These icons are both more numerous and more sophisticated than those employed in Mastering *WordPerfect 5.1*. The "New in 3.1" icon actually demonstrates Quark's linear blend feature—a feature that was, in fact, new in release 3.1.
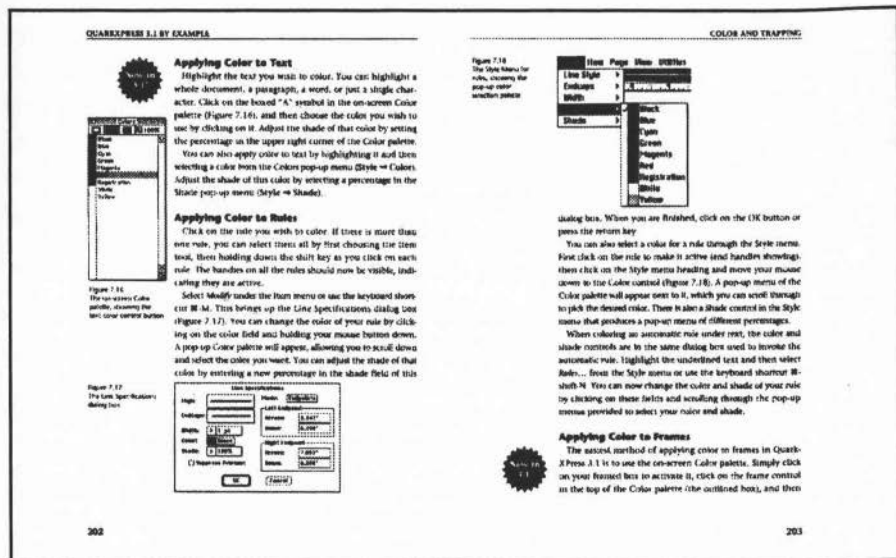
Figure 2. Surface design of a graphically-oriented text.

Interface structure

While the improvements in the design of surface structures between character-based applications and applications with graphical user interfaces are quite obvious to the viewer, the improvements in wayfinding features are more subtle. As mentioned previously, even with the early character-based applications, the wayfinding capabilities of the computer were far superior to anything available, or even possible, in the print medium. This does not mean, however, that the interface structure of the computer was easy for users to navigate. In fact, wayfinding on the computer can present unusual difficulties to today's users, acculturated as we are to the technology of print. As Kerr notes in his discussion of surface and interface structures on page and screen, navigation can present problems for computer users because on the computer, wayfinding is *invisible* (373). While the physical structure of the printed book —its thickness, its weight, its sequential succession of pages—contributes to the ease with which readers are able to locate themselves within the text and mark their progress through it, the immateriality of electronic text leaves users with no solid, tangible structure to cling to. This can result in a sense of disorientation and confusion when it comes to navigating the electronic "space."

In order to help users make the cognitive leap from wayfinding on paper to wayfinding on the computer screen, software engineers frequently employ design metaphors that provide a link between the software and the "real world" users are familiar with. DOS, for example, utilizes a tree metaphor to help users understand the arrangement of files, directories, and subdirectories on their disk drives. The tree metaphor has proved to be quite popular, but despite its wide implementation it is more suitable for those already familiar with file management than for newcomers to computer technology.

The shift to paper-based metaphors—found, for instance, in spreadsheet applications that depict the workspace as an accounting ledger, as well as in word-processing programs in which the work area resembles a sheet of paper on which the user types—represents a quantum leap for "virtual" wayfinding. The importance of this shift is due not so much to improvements in the computer's capacity to retrieve, link, and organize information, but to the fact that these capabilities now are made more "visible" to users. These kinds of design metaphors have been most successfully implemented in applications with graphical user interfaces, since graphic displays can facilitate the representation of real-world environments (such as a "desktop") on the computer screen.

Figure 3. Wayfinding in a Windows-based text.

While wayfinding in DOS-based applications was somewhat hampered by the opacity of the interface, applications designed for *Windows*, Macintosh, and other operating environments provide users with visual tools that help them navigate by indicating the relative dimensions of the electronic workspace and the relative position of the cursor within that space. In addition, graphical user interfaces tend to offer more alternative wayfinding techniques than the character-based programs. We have already seen how a book covering a DOS application offers navigational tools that improve upon the standard print apparatus of table of contents, page numbers, and index. Figure 3 shows an example of a book that reflects *Windows'* increased emphasis on highly visual and metaphorical wayfinding aids, as well as on providing users with a diversity of navigational options. This book is an alphabetical reference with individual entries covering the various tools and features offered in the *WordPerfect* application. The highly structured A-Z organization of the text is reflected in the layout, which resembles nothing so much as the interior of a commercial telephone directory, with its blocky banners, parallel columns of text, and alphabetic thumb tabs along the edge of the recto page (Figure 3). But just as *WordPerfect* users who enter the on-line help system of that product will have the option of using the help index, glossary, or "coaches"
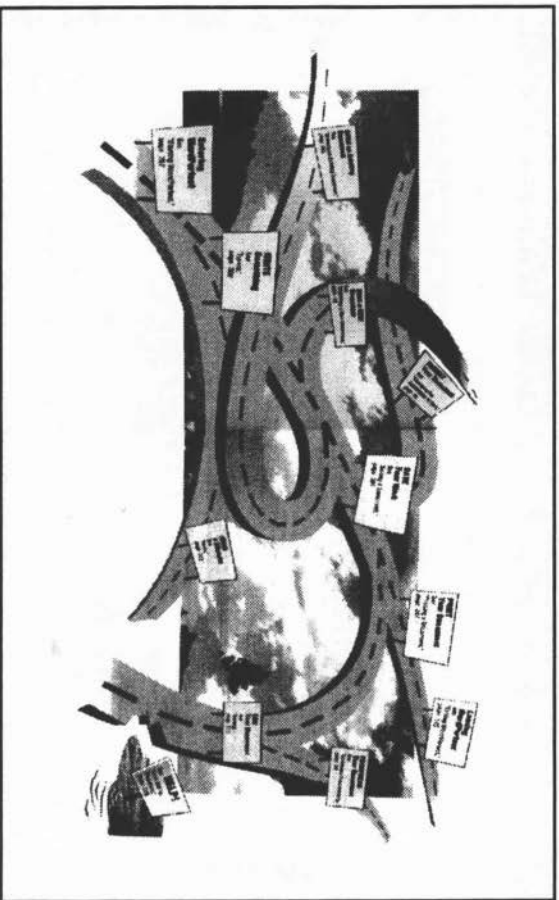
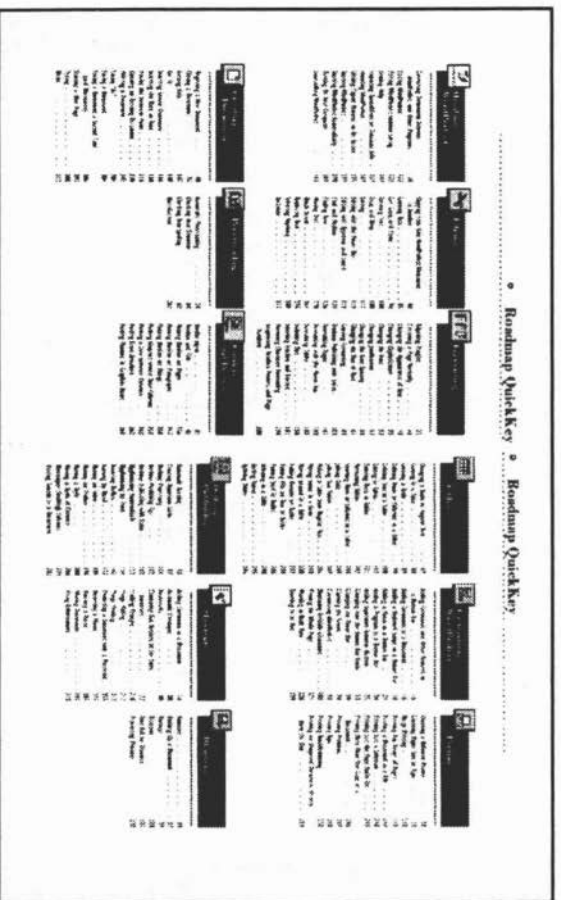Figure 4. Wayfinding in a Windows-based text.

Figure 5. Wayfinding in a Windows-based text.

- Roadmap QuickKey
- Roadmap QuickKey

(demonstrations), this book offers several alternative paths through the material in the book. The front endpapers (Figure 4), for example, depict a highway with various signposts that direct the user along a route of tasks (entries in the book) arranged in order of difficulty from the very basic to the more complex. This drawing not only makes concrete the wayfinding metaphor suggested by the book's title, *WordPerfect 6 for Windows Roadmap*, it offers a non-linear itinerary through the book for those who wish to proceed through an elementary tutorial. Meanwhile, the back endpapers (Figure 5) offer another kind of visual wayfinding technique, a "Quick-Key" index which groups the entries in the book functionally. Both front and back endpapers provide page references, thus serving additionally as complements to the book's table of contents and index. Abundant cross-references embedded in the main text facilitate the topical linking of items of information spatially separated in the text.

Mimetic page design

The examples illustrated thus far suggest ways in which the designs of computer-based instructional texts mimic in some fashion the surface and interface of the products they purport to teach. Figure 6 illustrates a text in which this mimicking of the graphical computer display is carried to a higher plane. The principal organizing "conceit" of this book, *The Push-button Guide to Word 6 for Windows*, is the use of running heads which contain, not text stating chapter and section title, but graphic representations of the toolbars available in *Word 6 for Windows*. The particular toolbar appearing on a given page is determined by the content of the page, reflecting the many function-specific toolbars available in the *Word 6* application. This wayfinding aspect of the toolbar running heads is further emphasized by the enlargement of any particular toolbar buttons discussed on the corresponding page. In addition, individual buttons appear beside relevant numbered steps, permitting the reader or user to proceed through the particular sections of the book from graphic to graphic rather than from one block of continuous prose to the next. Even the unusual square shape of the book, a deviation from the standard 7.5-x 9-inch trim customarily used for computer books, gives the pages an orientation resembling that of a computer screen. While the page designs shown previously in this paper have been based largely on the conventions of the print medium, even when they have responded to particular aspects of computer applications, this book turns the tables with a design that is fundamentally grounded in the visual arrangement of elements on a
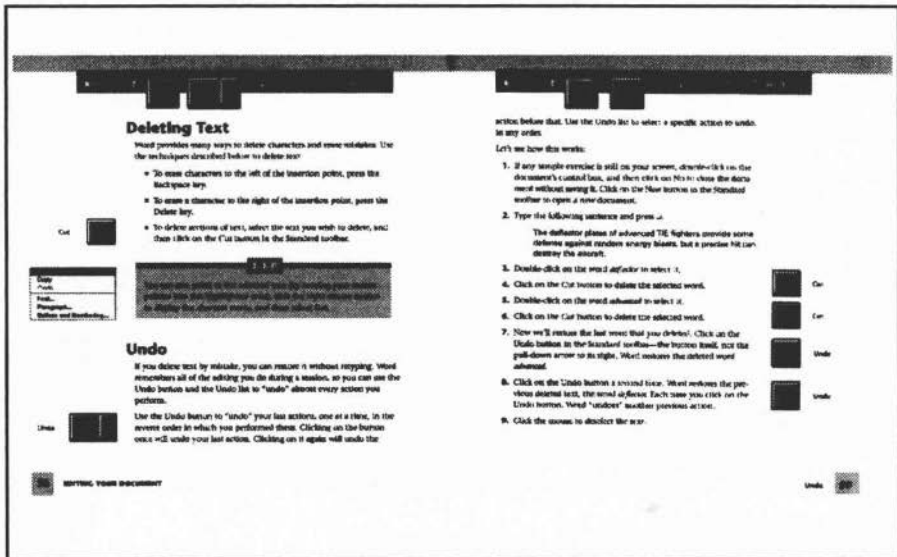
Figure 6. Page mimetics screen .

computer screen. Electronic screen design, which initially developed according to the pre-existing conventions of print-based page design, here exerts its own reciprocal influence on the medium of print.

Visual organization of text

The books illustrated in Figures 1 through 6 represent a range in which visual or graphic elements are utilized to varying degrees, from the predominantly text-oriented design shown in Figure one to the increasingly graphic designs shown in the subsequent figures. This kind of range or spectrum of graphic orientation has been analyzed by Stephen A. Bernhardt, according to what he terms a "continuum of visual organization" (19). Bernhardt envisions this continuum as a linear arrangement with texts that are highly visually informative on the left (texts characterized by heavy use of graphic signals and a diversity of typographic and graphic cues), and texts which are not significantly visually informative to the right (texts that appear as fairly homogenous, undistinguished masses of print). (See Figure 7.) Examples of visually informative texts might include lists, advertisements, and pamphlets, while non-visually informative texts include novels, journal articles, and some kinds of textbooks. With texts of the visually informative variety, it is possible for the reader
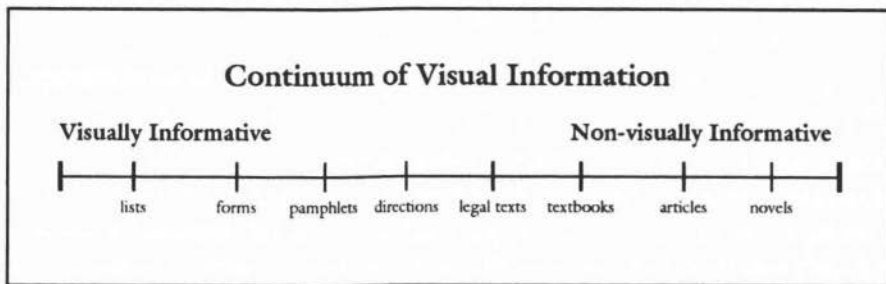
Continuum of Visual Information

Visually Informative   Non-visually Informative

lists   forms   pamphlets   directions   legal texts   textbooks   articles   novels

Figure 7. Continuum of visual information (Bernhardt).

to determine the structure of the text without reading. In texts of the non-visually informative type, the structure is not evident from the layout and must be determined by reading the text (tables of contents and other internal wayfinding devices aside).

Localizing and progressive texts

Analyses of texts at various points on the continuum of visual organization lead Bernhardt to classify text into two large categories: localizing texts and progressive texts. Localizing texts are those which arrest the reader's attention at specific places. In a list or other visually structured text, for example, the elements on the page are presented as discrete units, making it easy for readers to scan for specific information so that they do not have to read it sequentially and thoroughly from beginning to end in order to find what they need. In contrast, in a progressive text the reader is projected forward from sentence to sentence and paragraph to paragraph. The reader is not encouraged to stop, except perhaps between chapters or clearly defined sections.

As Bernhardt argues, texts that employ highly visible structuring—that is, texts which use predictable partitioning, clear headings, and other types of informative typographic and spatial cues—tend to be localizing texts (21). These texts lead to selective reading by encouraging readers to jump about in the text at will, focusing on those sections which are most useful or interesting to them and ignoring sections which are less relevant to their needs. Such visibly structured texts actually facilitate nonsequential, or nonlinear, readings. According to Bernhardt, such "visible cueing frees the reader from the necessity of reading in a linear fashion and allows the reader to direct attention to various locales within the text" (21). Bernhardt finds visible structuring to be a common rhetorical strategy in

specialist texts and in texts which bridge the gap between specialist and generalist (22).

Figure 8 shows a spread from *Word for Windows Quick & Easy*, a book that clearly would fall somewhere near the left-most extreme of Bernhardt's continuum. The book's goal of providing a practical, hands-on, beginning-level tutorial is advanced through its use of large four-color graphics which depict how the user's computer screen should look after completing each step of the tutorial. As in Bernhardt's prescription for a visibly constructed text, the layout of *Word for Windows Quick & Easy* employs prominent headings, predictable structuring of text, frequent lists (usually numbered steps which lead the reader through particular lists in progressive fashion but which tend to be localizing in their overall design), color-coded headers, and use of color within the main text to cue numbers, keywords, and text which the author intends the user to type. All of these features help make the text easy to scan, while facilitating the ease with which the reader can use the book to follow procedures carried out on the computer screen.

More than the other books we have examined thus far, the layout illustrated in Figure 8 encourages a different style of reading from what is generally expected with the conventional book format. By providing users with a highly visual format which allows the reader to determine the
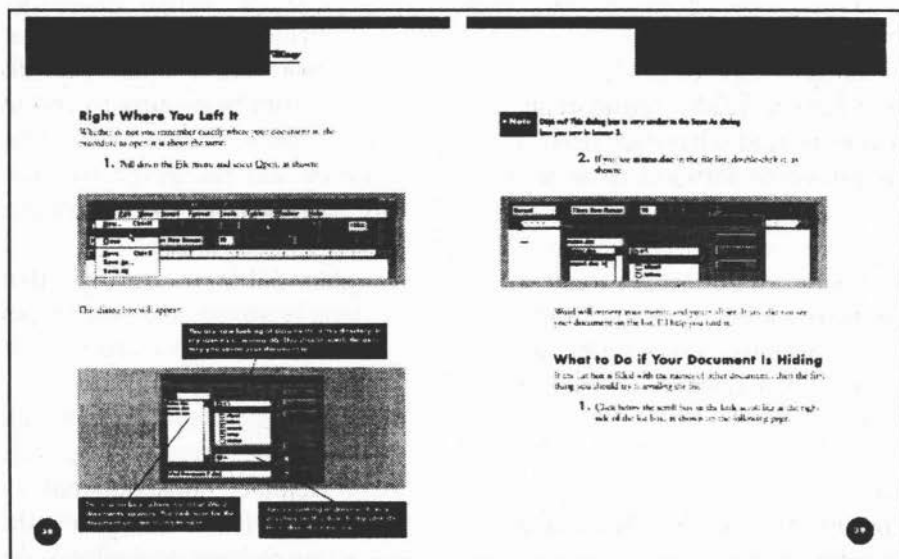

Figure 8. A visibly structured text .

structure of the book without reading it, this design actually encourages the kinds of information-gathering strategies that are frequently associated with electronic text: scanning for information, accessing information in a non-linear fashion, "learning by doing," and decoding visual structures as well as verbal constructions.

Synoptic images and composite images

The book shown in Figure 8, *Word for Windows Quick & Easy*, emulates the computer screen by providing a snapshot of the screen after each step of the tutorial has been completed. This attempt at introducing into the book format the representation of change over time is carried off more successfully in the text shown in Figure 9, a 1994 book called *Word 6 for Windows Simplified*. While *Word for Windows Quick & Easy* (Figure 8) uses large full- or half-screen images that present a single procedure over the space of several pages, *Word 6 for Windows Simplified* presents cropped images closely spaced in a manner which more effectively depicts the changing status of the computer screen. In both books, the use of *composite* images, or images composed of discrete elements, is a significant development over the *synoptic* images (illustrations which depict single, unified representations) used in the books shown earlier in this paper.[4]

The book illustrated in Figure 9 constitutes a further evolution of the workbook-style subgenre shown in Figure 8. Its color is of a superior quality, its graphics are of a higher resolution, and it attempts to illustrate three-dimensional images as well as flat, two-dimensional screens. In addition, it makes better use of the available surface structure through its sequences of partial screens closely spaced. The use of frequent sidebars and note or tip boxes enhances the localizing arrangement of the text, and the running heads, which use color as well as the position of the "book-mark" graphic as typographical and spatial cues, assist the reader in navigating through the book. In this layout we see the logical, if fleeting, culmination of the evolutionary progress of the computer-based instructional text to date. Here in printed book format, we find the realization of so much "hyperliterary theory": linear prose is decentered, text is subordinated to image, and the display of verbal and pictorial information is arranged in a fashion that facilitates scanning, localization, cross-referencing, and the retrieval of discrete items of information.
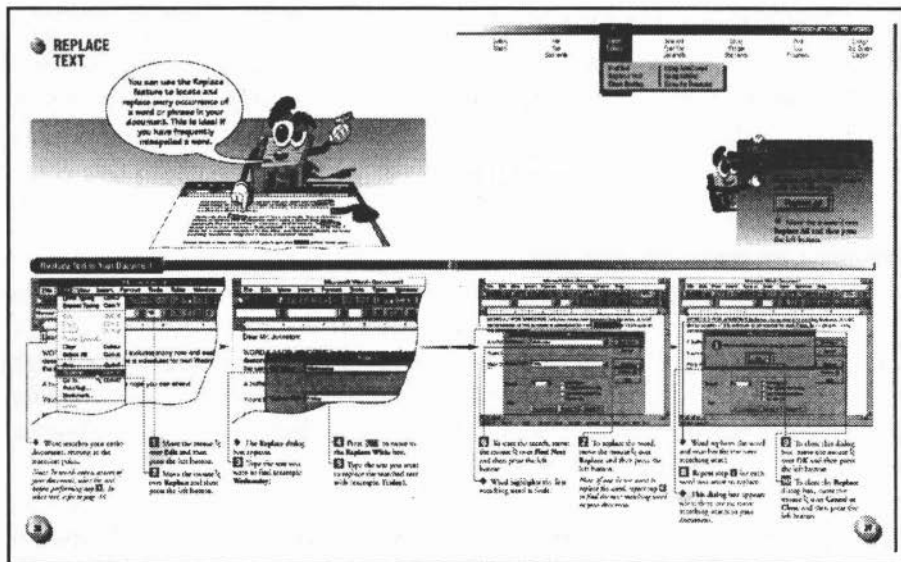
Figure 9. Visibly structured text with composite images.

Conclusion

In addition to demonstrating the enhancements of the printed book's surface and interface, the design of the book illustrated in Figure 9 raises some interesting questions about the direction of influence between page design and screen design. As with *The Pushbutton Guide to Word 6 for Windows,* shown in Figure 6, this book appears to be mimicking the "look and feel" of the application it "covers" (*Word for Windows*). Additionally, the book features a cartoon-like personification of a floppy disk—a screen-based metaphor that functions in this context as a friendly, *familiarizing* device. Moreover, the graphic displayed in the running head resembles both in its basic composition and in its function the menu bars and drop-down commands commonly featured in graphically-oriented computer applications. These running heads are not literal representations of wayfinding devices found within the application, as in *The Pushbutton Guide to Word 6 for Windows* (Figure 6); instead, they use a screen-based metaphor to help the reader understand the general organization of the book, as well as his or her position within the text relative to its overall structure.

All of these obsevations suggest that, contrary to the conventional wisdom of literary critics engaging in hypertext theory, the print medium

is not only responsive to electronic text but also is capable of appropriating for its own ends elements of the computer's surface and interface structure. The object is not to compete with electronic media (although an increasing number of books are packaged with a floppy disk or CD-ROM) but to complement the new media. *In Hypertext: The Convergence of Contemporary Critical Theory and Technology*, George P. Landow asserts that electronic text has been seen as "a direct response to the strengths and weaknesses of the printed book" (3). As this paper has shown, the inverse of Landow's statement is also true: the printed book continues to develop in direct response to the strengths and weaknesses of electronic text.

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Notes

1. The observations presented in this article arise from my work in various editorial and managerial capacities in the computer book segment of the publishing industry between 1990 and 1994. Although I was the editor of some of the books discussed in this article and participated in the development of particular series, I did not have primary design responsibility for any of these books. The argument I advance reflects a general trend in the design of computer-related instructional books and extends beyond the specific case studies presented here.

2. George P. Landow, for example, writes that "one can guess that continuing improvements in desktop publishing and laser printing will produce a late efflorescence of the text as a physical object" (23). In a similar spirit, Michael Joyce argues that "[n]o less than the sitcom or the Nintendo cartridge, the book too is merely a fleeting, momentarily marketable, physical instantiation of the network"—this despite the fact that we live "[i]n an age when more people buy and do not read more books than have ever been published before . . . ."

3. See James Hartley's *Designing Instructional Text*.

4. Michael Twyman discusses synoptic and composite images in his article "Using Pictorial Language: A Discussion of the Dimensions of the Problem," published in the anthology *Designing Usable Texts*.

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