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Explicit Structure in Print and On-Screen Documents

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The structure of print and on-screen documents is made explicit through headings and links. Three important concepts for understanding explicit structure are (1) the display-unit properties of each document medium, (2) the flexible relationship between explicit and implicit structure, and (3) the distinction between populated and unpopulated locations in a hierarchy. These concepts help us better understand standard print documents, structured writing, websites, help systems, and PowerPoint, as well as the potential effects of content management systems on how documents are created.

Contemporary rhetoricians, including those who study technical communication, are most often concerned with documents in their social contexts, as dialogues with readers and dialogues among those producing the document (Bazerman and Paradis; Blakeslee). We must not, however, forget to look closely at the document itself, for reading and document use are ultimately about the close encounter between people and the document features they look at and click. Among the most important document features are those that make explicit the structure of documents. The primary means to make structure explicit is through headings and links.

In this article I identify and explain three concepts that further our understanding of explicit structure and can contribute to the design of more effective documents: (1) the display unit and display-unit properties, (2) the flexible relationship between explicit and implicit structure, and (3) the distinction between populated and unpopulated locations in a hierarchy. These concepts yield insights regarding the construction of almost every kind of professional document, print and on-screen, other than brief memos and the like. I demonstrate this through a survey of five very broad categories of documents, including expository print documents; structured writing—in particular, Information Mapping™ and STOP; websites; help systems; and PowerPoint slides. These categories are broad because they are

defined by medium and, in the case of structured writing, by format. Each category spans many genres, with the exception of help, which is a medium consisting of a single genre, although a prevalent one. My survey brings each category into sharper focus, making clear commonalities and differences among them and pointing to useful design considerations and recommendations. In addition, the survey contributes to our understanding of a key issue facing the field of technical communication as a whole: the implications of content reuse and content management systems.

THE STRUCTURE OF PRINT AND ON-SCREEN DOCUMENTS

When we look closely at print documents, we see shifts and divisions of all kinds. For example, a corporate report may describe a multifaceted problem and then shift to three possible solutions, each consisting of several specific plans of action. These shifts and divisions make up the structure of the document. For the most part the structure of print documents is hierarchical. In reports, white papers, scientific journal articles, proposals, manuals, most nonfiction books, and many other kinds of documents, a hierarchy takes shape through the subordination of ideas, with broad topics encompassing more specific ones. Among the most important kinds of nonhierarchical documents are narratives, both fiction and nonfiction. These are chronological and episodic rather than hierarchical. In addition, many essays employ a loose, associative structure.

Document structure remains implicit until it is made explicit. In print this is achieved primarily through the use of headings. (Another way to make structure explicit is through a plan of development statement that previews the major divisions in the upcoming portion of the document.) The idea of headings in this context must be broadly defined. For example, in the case of books the system of headings includes part and chapter divisions.

On the Web the most important means of establishing explicit structure and the means that is most characteristic of the medium is the use of links. Links define the relationships among the Web pages (or hypertext "nodes") as they enable navigation. At the same time, headings reveal explicit structure on individual Web pages, just as they do in print. As in the case of print documents, almost all websites are hierarchical (Rosenfeld and Morville 65). The home page (the top of the hierarchy) provides links to the various branches of the hierarchy, and these branches split and split again at each level of the hierarchy. Likewise, help systems are organized hierarchically (Boggan, Farkas, and Welinske), and hierarchical structure predominates in other forms of hypertext (McKnight, Dillon, and Richardson). The hierarchical nature of most documents, print and on-screen, should not be surprising; human beings employ hierarchies of all kinds to impose order on our world. We

have taxonomies of plants and animals, and we divide our planet into continents, nations, and smaller units such as provinces and districts. Many activities in modern societies require the ability to comprehend and create hierarchies.

The Display Unit and Display-Unit Properties

The first of the three structure-related concepts, the display unit, refers to the physical unit of content of a particular medium. In most print documents the display unit is the page. (Exceptions include posters and business cards.) On the Web, the display unit is the HTML page (or the equivalent in alternative technologies such as Macromedia Flash), and on PowerPoint it is the slide. The display unit in most forms of help is the help topic. Display units differ in their properties. For example, whereas the print page has fixed dimensions, Web pages scroll and can be resized by the user. As we shall see, there may also be differences in the display-unit properties of different documents belonging to the same medium. Because the display unit of a document frames and bounds the text and graphical content, the display-unit properties of any document significantly affect how the document is organized and formatted—hence its explicit structure.

The Flexible Relationship Between Explicit and Implicit Structure

Although we can make the general statement that important divisions in a document are marked with headings, writers generally enjoy considerable freedom in this regard. Furthermore, although we may assume that explicit structure maps logically to implicit structure, such techniques as tucked introductions, tucked conclusions, and interior subordination (discussed following) depart from strict logical subordination and demand a flexible relationship between explicit and implicit structure. Finally, once we recognize that headings and links are both elements of explicit structure, we see in the Web (and other forms of hypertext) a new variable in the relationship between explicit and implicit structure: Will a division in the document hierarchy be marked by a heading on an HTML page, or will the author create and link separate pages?

Populated and Unpopulated Locations in a Hierarchy

The distinction between populated and unpopulated locations in a hierarchy is a special case of the flexible relationship between explicit and implicit structure. When locations are unpopulated, elements of explicit structure follow each other directly without any intervening text or other content. In print, unpopulated locations arise when a heading is followed not by body text but by another, lower-level heading. A prevalent term for this is stacked headings. An example of unpopulated

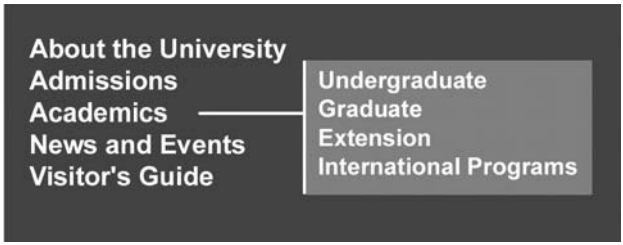


FIGURE 1 A website's flyaway menu system.

locations on the Web is the flyaway menu system shown in Figure 1. If the user rolls the mouse over the Academics link, the system simply offers a menu of links rather than content. We will now see how these three structure-related concepts can enhance our understanding of print and on-screen documents.

THE STANDARD EXPOSITORY MODEL

I use the term *standard expository model* to denote the vast number of nonfiction print documents that (1) are primarily informational rather than expressive; (2) are intended to be read linearly (broadly speaking, from beginning to end); and (3) reveal structure explicitly with at least one heading level but very often more. The standard expository (SE) model came to maturity during the Renaissance and is now the norm for nonfiction books, reports, proposals, and scientific papers, as well as for other genres (Pegg).

In the SE model a key property of the display unit—the print page—is that page boundaries are not salient. As we read, we barely notice when we make the transition from one page to the next. Nor does the page greatly affect the design and production of SE documents. By and large, a stream of text along with some graphics is poured from one page to the next. Because the display-unit boundaries are not salient, we can envision an SE document as a long ribbon of text with headings but without page breaks.

The Flexibility of the SE Model

Because the SE model is so familiar, we do not often step back to examine it from a fresh perspective. When we do, we notice that the flexible relationship between explicit and implicit structure enables writers to create and reveal structure in an expressive, nuanced manner that reflects both their subject matter and their rhetorical

goals and strategies. The near invisibility of page boundaries frees writers from constraints. It provides a blank canvas on which to impose explicit structure.

Writers, for example, often divide and subdivide their material extensively and fully mark this highly subordinated structure with headings. Alternatively, they may write in a looser style with fewer divisions and less subordination—and therefore fewer headings. Another set of choices turns on not fully marking the implicit structure with headings. Writers may employ only one or two levels of headings, even though the text is actually organized in a clear but implicit hierarchy down to the third or fourth level. Writers do this when they judge that a succession of headings introducing relatively small amounts of text would disrupt the continuity of the writing (Rude 316) and degrade the appearance of the document (Kumpf 410).

Special Techniques for SE Documents

Writers, especially sophisticated writers, employ other techniques that depart from straightforward logical subordination. These techniques entail special mappings of explicit to implicit structure. They include (1) tucked introductions and conclusions, (2) interior subordination, and (3) stacked headings. Other techniques are described in the article "Managing Headings" (Farkas).

A conventional introduction previews important ideas that lie ahead. This previewing is the familiar rhetorical pattern we call partition, also referred to as the plan of development statement. In the case of the general introduction to an entire document, the ideas that are previewed correspond, at least roughly, to the document's first-level headings. Section introductions follow a similar pattern, although the previewing often becomes more approximate at the lower heading levels.

At times, however, writers choose to violate the strict logic of conventional subordination by "tucking" a brief plan of development statement into the section that explains the first of the main points. Consider, for example, a writer whose initial draft includes a section with the first-level heading "Three Key Testing Methods" followed by a brief introductory sentence and a plan of development statement introducing the ABC, MNO, and XYZ tests. This section would typically be followed by three second-level sections, each explaining one of the three tests. This writer, however, deletes "Three Key Testing Methods," promotes the second-level heading "The ABC Test" to the first level, and tucks the introduction to all three tests under "The ABC Test"— thus "It is necessary to choose the most appropriate testing method. The three most widely used tests are ABC, MNO, and XYZ." This section continues with an explanation of the ABC test and is followed by two more sections with first-level headings that explain the two other tests. The benefit of tucked introductions is that they streamline the presentation and prevent a drop in heading levels. Writers recognize that too many heading levels burden readers, and publishers often limit the number of heading levels writers may employ.

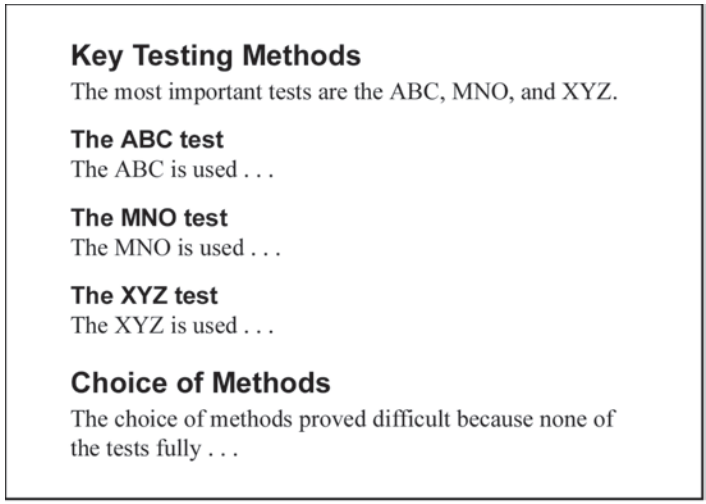


FIGURE 2 Conventional subordination.

Conclusions can also be tucked. If explicit structure truly corresponds to the underlying organization of the document, a document's general conclusion should have its own first-level heading. In many cases, however, especially when the conclusion is brief, writers simply append the general conclusion (without a conclusion heading) to the end of the document under the final (nonconclusion) first-level or even second-level heading. Along similar lines, the conclusion to an entire book may appear not as a conclusion chapter but as a conclusion section appended to the final (nonconclusion) chapter.

Another technique can be called "interior subordination." Rather than subdivide a section into two or more subsections and then begin a new section, a writer can subdivide (and indent) within the section and then allow the section to continue after the subpoints have been made. This technique is especially prevalent when the subsections are relatively brief. Conventional and interior subordination are compared in Figures 2 and 3. At times, sidebars (boxes containing text on a subordinate or related topic) also function as a form of interior subordination.

The last of the special techniques considered here is stacked headings. A writer who begins a section with the heading "Difficulties with Help Systems" may wish to proceed directly to the subheading "Help disrupts the user's workflow" rather than write a brief overview paragraph that does little more than name the three difficulties. Although stacked headings are often prohibited in style manuals and in publishers' instructions to authors, they are not uncommon in competently written workplace documents.

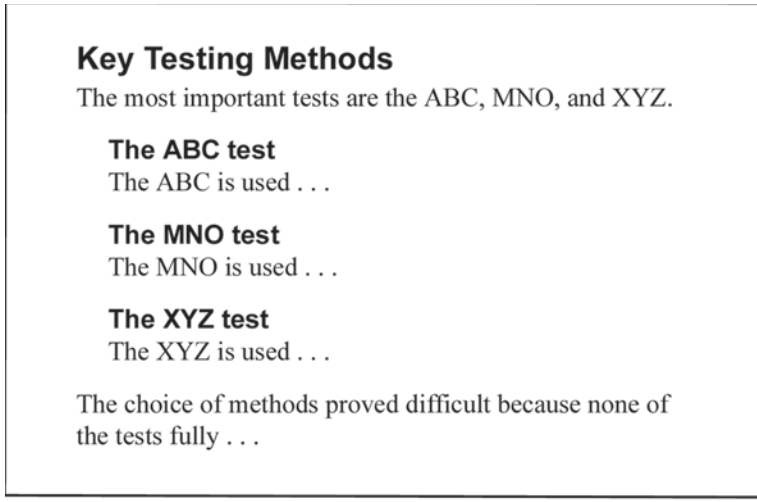


FIGURE 3 Interior subordination. Notice that the section "Key Testing Methods" continues after the appearance of the three subordinated subsections.

Writer's Choices Remain Uncodified

Both the range of routine options for manipulating headings and the specialized techniques are little noticed in writing textbooks and writing instruction. Only brief and rudimentary discussions of organization and the use of headings are to be found in most technical and business writing textbooks, or even in the popular advanced textbook titled *The Professional Writer: A Guide for Advanced Technical Writing* by Gerald Alred, Walter Oliu, and Charles Brusaw. This is probably because explaining these choices is not easy and because both textbooks and instructors have a great many topics to cover. You will find published commentary about organization keyed to a few important genres, most notably discussions of the standard divisions of a scientific journal article (Montgomery). But such commentary still leaves open the question of how to organize a theory or results section. The flexible nature of the SE model comes into sharp relief when we consider structured writing.

STRUCTURED WRITING AS A CHALLENGE TO THE SE MODEL

The SE model has at times been challenged by those who seek to supplant it or limit the circumstances in which it is employed. From one quarter come those who recognize that SE documents do not greatly exploit the human visual channel and

who therefore champion various kinds of informationally rich diagrams (Hartley; Horn, "What Kinds;" Pegg). Another challenge comes from proponents of structured writing, notably Information Mapping™ (Horn, *Mapping Hypertext*) and STOP (Starkey; Tracey, "STOP, GO;" Tracey, "Theory and Lessons;" Tracey, Rugh, and Starkey), although there are other forms as well (Horn, "Structured Writing;" Performance Technology Associates; Showstack). Although a text-based rather than diagrammatic model, structured writing employs layout to reveal explicit structure at a finer level of granularity than the SE model. Furthermore, the structured writing model is far more constraining than the SE model and, in addition, often entails specific procedures that encompass all phases of developing a document. On a practical level, structured writing is sufficiently prevalent and useful to warrant the attention of technical communicators. Beyond this, the design considerations inherent in structured writing can lead to a broader understanding of explicit structure across all types of documents.

Information Mapping™

Information Mapping™ (IMAP) is a proprietary model and method for creating print (and, in later years, on-screen) documents. IMAP was developed by Robert Horn in 1965 and is widely employed, especially for writing policy and procedure manuals. IMAP is taught through classes offered by Information Mapping, Inc. (Waltham, Massachusetts). An information map, the key unit of discourse in Information Mapping™, is shown in Figure 4.

Horn's starting point was that the paragraph is a poorly defined and marginally useful unit of information ("What Kinds of Writing"). Writers work without clear principles that tell them when to start a new paragraph or what a paragraph should contain. Concomitantly, readers have very limited expectations as to what each new paragraph will bring. Horn, therefore, devised a paragraph-length unit of information he called the "information block." Among the many kinds of information blocks are definition, fact, principle, example, decision table, and procedure. Information blocks are visually distinct from one another and are labeled.

Information maps typically consist of seven plus or minus two information blocks, reflecting in part George Miller's seminal work on the limits of human short-term memory. Like information blocks, information maps are standardized; they conform more or less to familiar rhetorical categories (procedure, process, concept, etc.). A group of information maps makes up a section; a group of sections makes up a chapter.

In contrast to the SE model, a display-unit property of the print page in IMAP is salient page boundaries. Because information maps are formatted as discrete units, the reading process may be disrupted when an information map spans two or more pages and, especially, when a map spans the turning of a page. For this reason information maps are generally fitted to one- or two-page spreads (Horn, *Mapping*

TO: All University Faculty and Staff
FROM: Recovery Services
DATE: January 18, 2004

Contact Recovery Services after an event that has caused damage to documents

Problem	Hasty actions can hinder the recovery of damaged documents.
Example	Unless water-soaked documents receive expert treatment, they may become unsalvageable. Furthermore, it is often very difficult to re-organize records when documents have been spread out to dry in an unsystematic manner.
Solution	Report damage to Recovery Services and utilize their guidance and direct assistance when recovering damaged documents.
Caution	Do not attempt to re-enter damaged area until given clearance from public safety officials.
Procedure	Steps to take following an event that has damaged documents:

Step	Action
1	When you can enter safely, determine the kinds of documents that have been damaged and the kind and degree of damage. Disturb documents as little as possible.
2	Contact Recovery Services (685-8659) for guidance and assistance. They will promptly send trained recovery staff to work with you.

FIGURE 4 An information map consisting of the information blocks Problem, Example, Solution, Caution, and Procedure.

Hypertext 94). In the words of the IMAP training notebook, "Put each Map on a single page if it is possible.…Readers…like the 'completed' feeling it gives" (Horn, *Participant's Manual* 3-B-11). Information Mapping, then, both observes display-unit boundaries and provides explicit structure at a much finer level of granularity than the SE model. Two benefits are that readers can easily scan an IMAP document for the specific information they want and can immediately grasp the overall structure of the information map they are looking at.

Horn's *How High Can It Fly?* summarizes ten research studies showing the effectiveness of IMAP. In a recent paper, Carel Jansen challenges some of these studies and describes two studies of his own in which factory workers tested on brief IMAP procedures performed no better on information retrieval and reading performance tasks than with reasonably well-written procedures that employed standard formatting. However, as Jansen notes, IMAP might have proven superior to conventional procedures had longer documents been tested. Furthermore, Jansen's subjects reported that they preferred using the IMAP procedures. Quite apart from the question of information retrieval and reading performance, another very important benefit of IMAP is that unskilled writers who would otherwise create highly dysfunctional documents can be trained to create successful IMAP documents, and as I have observed, they often become enthusiastic practitioners of IMAP.

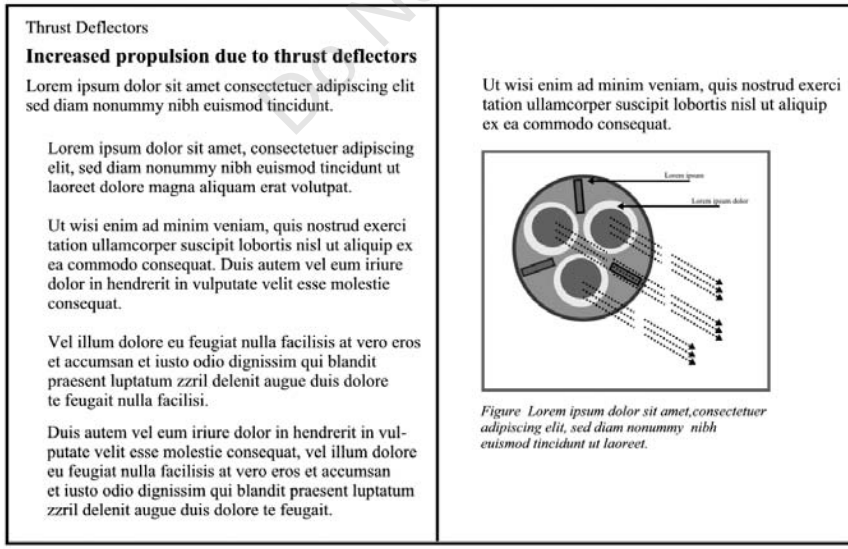
STOP

In 1965, the same year that saw the birth of Information Mapping™, the Hughes-Fullerton division of Hughes Aircraft issued an internal report titled *Sequential Thematic Organization of Publications (STOP): How to Achieve Coherence in Proposals and Reports*. This document, which I refer to as the STOP report, was written by three members of their technical publications group: James Tracey, David Rugh, and Walter Starkey. The STOP report, which is itself a STOP document, both propounds STOP and mounts a comprehensive attack on the SE model. The STOP report authors argue that the SE model is inherently dysfunctional for all but literary writing and that both readers and those who write and edit documents benefit greatly by adopting STOP. Although the STOP report is outdated and was, I think, idiosyncratic even in its time, there is merit in many of the key STOP concepts, and the STOP report still holds considerable value for the study of technical communication.

After the publication of the STOP report, Tracey gave several presentations and published commentary about STOP, and STOP was well known and widely practiced for a decade or two before gradually falling into obscurity. Although STOP has never (to my knowledge) been empirically tested, there is significant anecdotal evidence supporting its effectiveness (Carte and Landers; Starkey; Tracey, "Theory and Lessons"; Tracey, "STOP, GO"; Weiss; Zimmerman and Marsh). Interest in STOP was renewed with the republication of the original STOP report in 1999, with favorable commentaries by Jonathan Price, Mark Bernstein, Robert Horn, and Edmond Weiss. Furthermore, STOP has had ongoing influence in the computer industry through Edmond Weiss, who popularized STOP-like formatting in his influential book *How to Write a Usable User Manual* and through decades of consulting.

STOP documents consist of modules that address a single topic. Each module must be a spread, normally two pages. As in IMAP, the print page as display unit is important in STOP because the rigid, salient display-unit boundaries significantly constrain the writer. A typical STOP module is shown in Figure 5. Each two-page spread begins with a special set of display elements: (1) a heading (and if desired a subheading), located at the top left of the page; (2) a title, located beneath the heading; and (3) a thesis statement, located beneath the title. These display elements introduce the body of the module, which usually includes a visual. The visual must appear on the right-hand page of the spread. A STOP module should consist of between 350 and 1,000 words, with 500 words being the target length. When necessary, a module can employ a fold-out page to accommodate, for example, 1,000 words and a large graphic. The STOP report states that the body text will often be divided by one level (but only one level) of body headings. Thus, explicit structure in STOP is relatively fine-grained, although less so than in IMAP.

One of the major objections to SE documents expressed by the STOP report authors is that writers tend to create broad, conceptually phrased headings such as "Thrust Deflectors." These headings, which are called categorical, reveal the overall structure of the document and the reader's place within it, but they also encourage writers to produce lengthy, unfocused text under these headings. In STOP, however, the equivalent to the first-level headings of an SE document are module titles that must state or imply a proposition, such as "Operation of thrust deflec-


Thrust Deflectors

Increased propulsion due to thrust deflectors

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FIGURE 5 A STOP (Sequential Thematic Organization of Publications) module occupying its two-page spread.

tors," "Increased stability provided by thrust deflectors," and "Increased propulsion due to thrust deflectors." These module titles and the restricted word count of STOP modules result in more focused writing than does the SE model. But what of the need to reveal the overall document structure and the reader's current location? This is the role of the STOP headings, which are much like traditional running heads and are intentionally categorical in phrasing. So, for example, all the thrust deflector modules might share the categorical heading "Thrust Deflectors."

The STOP report authors informally cite principles of human cognition and memory to argue that the word count they specify for STOP modules is a natural unit of discourse. If a module requires more than 1,000 words, it almost certainly addresses several significant topics and therefore should be broken up into two or more modules. If a module runs less than 350 words, it should be further developed or else incorporated into another module. Although there is a procrustean inflexibility to restricting the word count of modules, the underlying purpose—to give modules unity and focus—is sound. Furthermore, I have seen (and written) STOP-like documents that are less rigid than true STOP, allowing for both one- and two-page spreads, sidebars, and graphics that are placed freely within the body of the module.

Among the other benefits of STOP are scanability and layered presentation (Holland, Charrow, and Wright). Users can skim the headings and module titles looking for modules of interest. Furthermore, they can read just the title or thesis statement of a module rather than the body, or they can read the title and thesis statement so as to better comprehend the body (Lorch and Lorch). STOP also offers important benefits in the document development process because reviewers and editors can conduct efficient walk-throughs in which they assess and improve the organization of draft modules while reading just the display elements.

THE FUTURE OF THE STANDARD EXPOSITORY MODEL

Despite the merits of structured writing and other alternatives, the SE model remains vastly more prevalent. Why? One reason is that the SE model has the weight of many centuries behind it. Also, many people, consciously or not, retain a commitment to the craft and nuance allowed by the SE model. Another important reason is that the SE model demands little from writers. Although savvy writers do great things with it, the SE model can be employed in a very rudimentary manner. Indeed, in contrast to the detailed specifications and methods that comprise IMAP and STOP, students everywhere graduate from college and begin writing workplace documents—though often bad ones—having absorbed just a few ideas about organization and headings. A final reason why the SE model predominates is that it

demands little from publishers. With little need to coordinate with authors, publishers choose page dimensions, line lengths, and fonts and then pour the author's text stream from page to page. Similarly, they enjoy considerable latitude in the placement of visuals. Contrast this to the much more exacting and expensive task of laying out an IMAP or STOP document or other kinds of books, such as many children's books, that are chunked into spreads.

We are, however, entering the era of content reuse and content management systems, at least for broad classes of documents. Content reuse and content management systems will challenge the traditional flexibility of the SE model. We may see in many SE documents a finer-grained structure, implicit and explicit, so that these documents can yield reusable information objects. We may also see more standardization and a tighter correspondence between explicit and implicit structure. Tucked headings and conclusions, interior subordination, and other special techniques are problematic from the perspective of content management. One cannot, for example, readily reuse a document section that explains the ABC test if it contains a sentence previewing the MNO and XYZ tests. In many settings new pressures to curtail the writer's freedom will be broader in scope and more firmly enforced—very likely by the use of templates and other constraining technologies—than the traditional editorial pressures to conform to house style (Clark). Certainly content reuse and content management systems play to the strength of existing and new forms of structured writing (Horn, "What Kinds of Writing;" Rockley; Sakson). Structured writing consists of components that can be treated as information objects to be recombined and reformatted across different media and for different purposes.

No doubt this tension will often be resolved on the basis of genre and specific publication requirements. We will set up "document factories" to produce manuals while allowing much more freedom to writers of strategy documents and corporate white papers. Even so, future scholars of writing and literacy may look back on the beginning of our current century as the time when the content management publication paradigm with its ambitions for much greater efficiency at least partly curtailed the freedom afforded to writers by the SE model and older, less efficient publication methods.

THE WEB

Because the Web is a hypertext medium, explicit structure takes the form of both headings and links. Those who write for the Web enjoy much the same freedom in regard to headings as they have in the SE model. Not only are they unconstrained within a single scrolling Web page, they are also relatively unconstrained by the prevalent technique of allowing long Web documents to span multiple pages con-

nected by Previous and Next links. For the user, clicking a Next button is much like turning a page: The display unit boundaries are not salient.

Web designers, furthermore, encounter a different set of choices in managing explicit structure because at many junctures they choose between headings and links. Instead of long Web pages with several levels of headings, they can create fine-grained hypertext consisting of short pages. The inherent flexibility of the Web medium, however, can certainly be curtailed by the constraint and standardization that may come with content management systems.

Another aspect of explicit structure—the use of unpopulated locations—is an important design option for Web navigation. Unpopulated locations are the basis of many flyaway menus, drop-down menus, and tab designs. In Figure 1 we saw a flyaway menu system in which level 2 of the hierarchy was left unpopulated. In Figure 6 we see a tab design with an unpopulated second level. Unpopulated locations in Web navigation are represented diagrammatically in Figure 7. In many cases the result of an unpopulated navigation hierarchy is to eliminate an overview page.

Thus, an interesting difference becomes apparent in the function of unpopulated locations in print versus the Web. In print, overviews are a major component of general and section introductions and serve primarily as signaling devices to preview the text that users will encounter (Lorch and Lorch). By eliminating overviews (which are sometimes mere placeholder text), stacked headings streamline documents, but they may lessen the reader's ability to comprehend the upcoming section of the document. On the Web, unpopulated locations can be used to streamline navigation, but they place on designers the burden of writing link text that will enable users to successfully disambiguate the links and make correct navigation choices without the support of overview information.

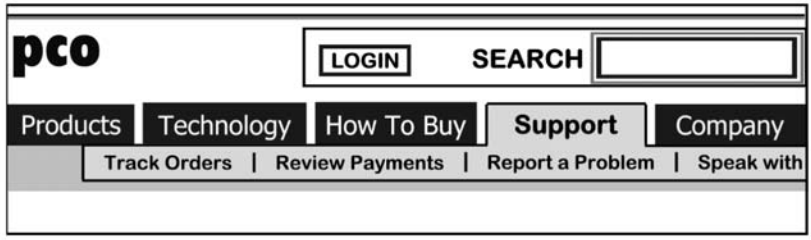

FIGURE 6 A tab design that employs unpopulated locations. Clicking the "Support" tab displays only more links.

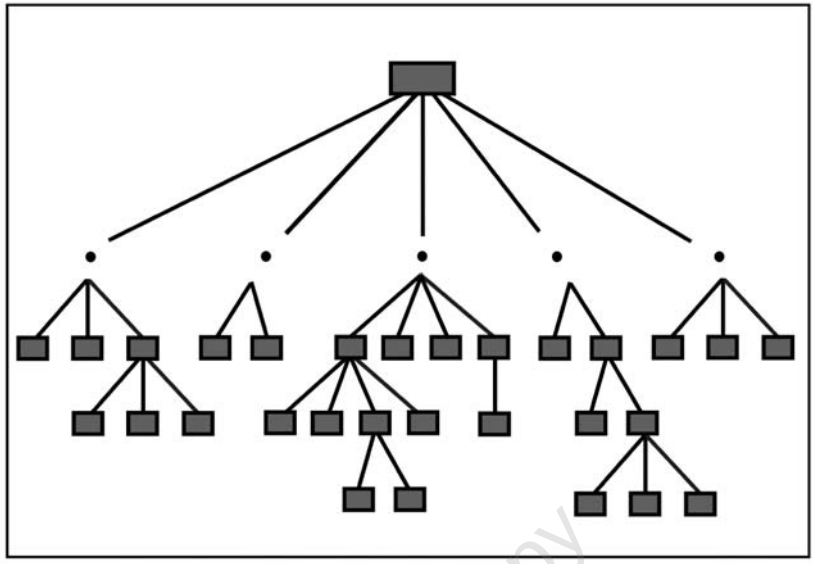

FIGURE 7 A diagrammatic representation of a website in which level 2 of the hierarchy consists of unpopulated locations (shown as dots).

HELP SYSTEMS

Help systems take various forms. The most prevalent form, which can be referred to as standard application help, is shown in Figure 8. Help serves a reference function: It enables users to quickly access a specific item of information, very often a procedure, and then return to productive work with the software application. For this reason, numerous forms of access are provided. These include a search feature, hyperlinks from one help topic to related topics, and an expandable table of contents. The expandable TOC, which programmers call a tree control, is also found in certain websites, especially those that serve a reference function.

Although help is an on-screen medium, help topics differ from most Web pages in a fundamental display-unit property: Help topics are brief, highly chunked display units typically containing just a single procedure. A help system, indeed, can be viewed as a collection of small information objects, a fine-grained hierarchy in which there is a close correspondence between explicit and implicit structure. This is one reason why help content is especially amenable to reuse through content management systems. Some forms of access, in particular the search feature, do not reveal this structure to the user; the user is querying a black box. But this structure is clearly revealed by the TOC.

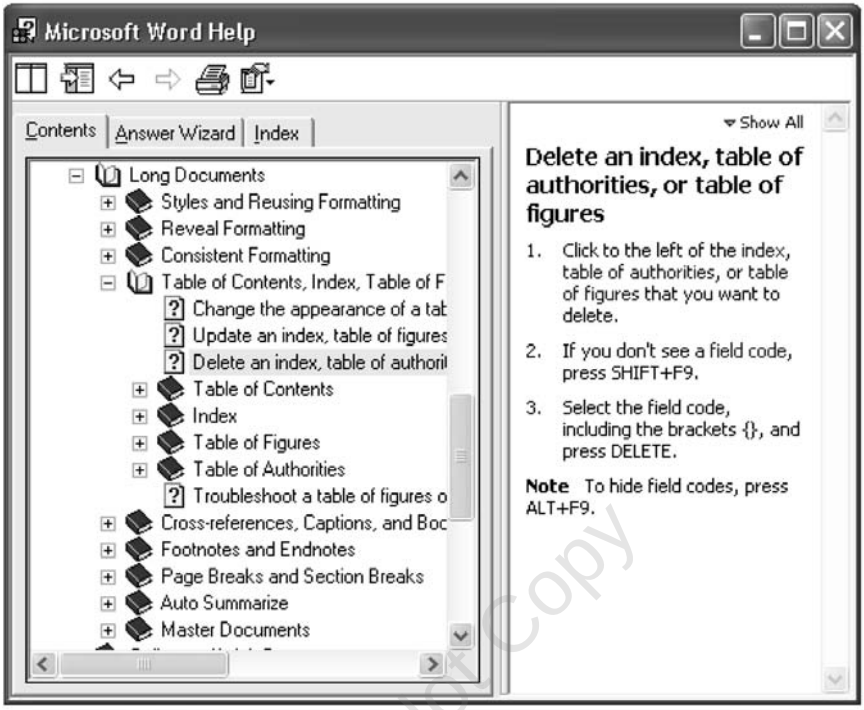

FIGURE 8 Standard application help (Microsoft HTML Help). The navigation pane contains open and closed book icons and page icons. In the main content area is a help topic consisting of a procedure. Reproduced by permission from Microsoft Corporation, 1983–2001.

In many help TOCs the locations of the TOC hierarchy are largely unpopulated. Help topics are associated with page icons, and book icons are just buckets that contain either page icons or other book icons. Users, then, are likely to click from book icon to book icon without displaying content. In other designs, all locations in the hierarchy are populated, so that clicking a book icon displays an overview topic associated with that book icon. In still other designs, the user can either display or bypass these overview topics—which is also true of some Web navigation schemes. There are, then, important similarities and differences between Web pages and help topics and between Web and help navigation, differences that are captured nicely when we consider display-unit properties, the relationship between explicit and implicit structure, and populated and unpopulated locations in a hierarchy.

POWERPOINT

Oral presentations supported by sets of slides (or decks) created with PowerPoint and similar products are an important communication medium that is ubiquitous in business and government and increasingly prevalent in education (Parker). Also important is a related communication medium, the stand-alone deck. Stand-alone decks appear on the Web and are distributed in other ways as well. Although oral presentations precede recorded history and presentations supported by visuals are not new, PowerPoint itself is less than two decades old and is both poorly understood and highly controversial. Both presentational and stand-alone PowerPoint, however, can be illuminated by the three structure-related concepts we are examining.

The PowerPoint display unit, the individual slide, has fixed dimensions, which are the full size of the screen. Display-unit boundaries are salient: Both live audiences and Web users notice when slides advance, and indeed the use of elaborate transition effects often makes the advance of slides salient to the point of annoyance. The fixed dimensions, the salient display-unit boundaries, and the relatively small amount of content that can be placed on a slide (in contrast, for example, to the print page) collectively have a major impact on design; slide content must be carefully fitted to the individual slides—there is no blank canvas here.

Presentational PowerPoint

Critiques and parodies, some harsh indeed, have been directed at PowerPoint presentations (Jaffe; Norvig; Parker; Tufte), and commentators claim that PowerPoint has a subtle but pernicious "cognitive style" (Parker; Tufte). The claim for a cognitive style, harmful or not, is sound. Whenever we use tools to design something, the tools are not entirely neutral but influence the design. When we work in a particular communication medium, we are influenced by the inherent characteristics and the practices of that medium. Edward Tufte's assertion that PowerPoint's cognitive style is Stalinist is extreme and not well argued, but the PowerPoint presentation medium does have limitations and deficiencies, notably the tendency to flatten a presentation's explicit hierarchy. Parker gets close to this idea when he speaks of the "staccato style" of PowerPoint. Can we better understand this problem, and are there ways to improve PowerPoint presentations?

In a well-planned PowerPoint presentation, the deck's slide titles and bullet points—much like the headings of an SE document—comprise the presentation's explicit structure. The explicit structure is then populated by the rest of the content making up the presentation. In other words, the slide titles and bullet points serve as a skeleton, or armature, for visuals, limited amounts of body text, brief multimedia sequences (if any), and—by far the most important—the presenter's voice, what Rich Gold calls the presenter's "oral gloss" on the slides (260). Figure 9

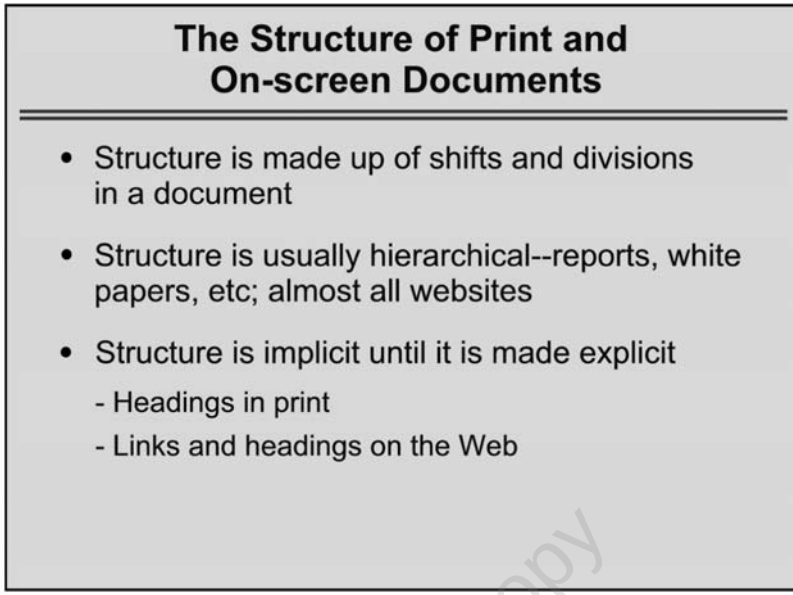

FIGURE 9 A well-designed PowerPoint slide consisting primarily of explicit structure.

shows a well-designed slide from a hypothetical PowerPoint presentation. The slide title corresponds to a first-level heading of a print document. The slide includes two levels of bullet points; the second level is introduced by hyphens. The second bullet item includes a few words of body text ("reports, white papers, etc; almost all websites"). The two levels of bullet points correspond to the second- and third-level headings of a print document.

In a poorly designed presentation, the bullet points are used not only for explicit structure but for excessive, dysfunctional body text that should be part of the oral gloss. Figure 10 shows one such faulty slide. In such decks a level of subordination disappears as elements of explicit structure migrate from the bullet points to the slide titles. Notice that the third bullet point in Figure 9 corresponds to the slide title in Figure 10. Also there are more slides than need be.

The reduced subordination of these flattened hierarchies makes it harder for audiences to distinguish main points from subordinate points. Furthermore, the reduced subordination allows presenters to formulate their ideas in a fuzzy manner. In contrast to PowerPoint, consider that deep, crisp explicit structure is integral to help. Another problem with these text-laden slides is that they compete with the presenter: The audience reads rather than listens, and the presenter, too, may wind up reading much of the slide text to the audience.

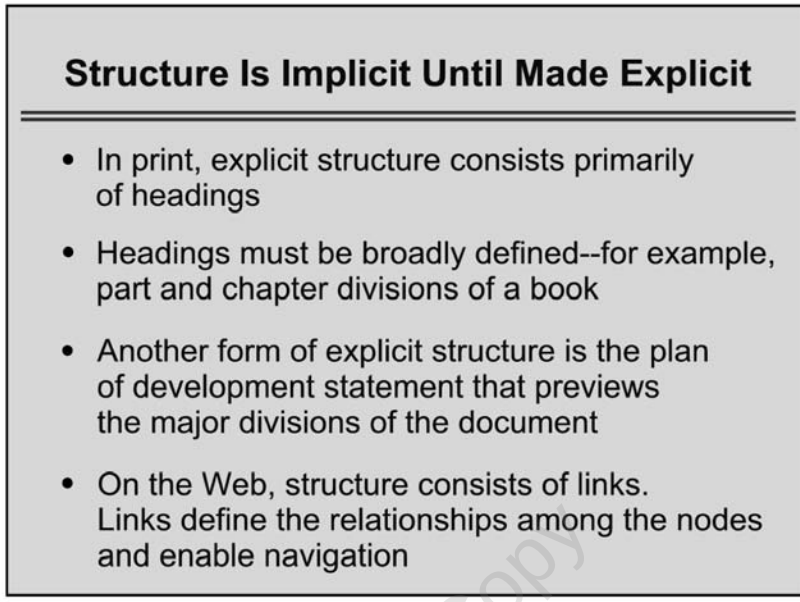

FIGURE 10 A faulty slide whose bullet points contain content that should be part of the oral gloss.

Why do we see flattened hierarchies and an excessive number of slides? I suggest that presenters often seek to reduce performance anxiety by using slides as speaker's notes. Instead of trusting themselves to deliver content orally, they want as much content as possible on the slides. One more reason for flattened hierarchies is that PowerPoint does not make it easy for presenters to associate a visual with a bullet point. By promoting the bullet point to a slide title, presenters have a ready location for the visual.

Although the impulse to put too much content on slides may always be with us, there are ways to achieve better subordination in PowerPoint. Designers can use middle-of-the-slide title slides (usually in a larger font size) to mark the main divisions in a presentation—in effect demoting the standard top-of-the-slide titles to level 2 headings. Microsoft could improve the medium by creating a slide layout called Section Title to encourage presenters to add this level of subordination.

Another way to improve PowerPoint decks emerges when we revisit another document type whose display unit has fixed dimensions: STOP. PowerPoint decks can borrow STOP's categorical headings, which (located perhaps at the upper right of each slide) could be phrased to reveal the logical structure of the deck. Some PowerPoint decks do employ headers of this sort, but we can hope to see their use become widespread.

Stand-Alone PowerPoint

Stand-alone PowerPoint must truly be designed for stand-alone use. We must be wary of distributing decks that were created to support a presentation. Divorced from the presenter's oral gloss, these repurposed decks are usually too sparse in content to be fully understandable by those who did not hear the presentation. In fact, the decks that best support presentations are least effective standing alone, for, as we saw in Figure 9, they consist primarily of the presentation's explicit structure and are not much populated with body content. Effective stand-alone decks must be rich in content. This content may take the form of audio sequences or text displayed in the PowerPoint notes pane that can be made to appear below each slide. Text-laden slides may also be necessary, but through careful design the explicit structure will still be clear to the user, and appropriate subordination can still be maintained.

CONCLUSION

I have surveyed standard expository documents, structured writing, websites, help systems, and PowerPoint decks through the lens of three concepts: (1) display units and display-unit properties, (2) the flexible relationship between explicit and implicit structure, and (3) the distinction between populated and unpopulated locations in a hierarchy. The survey reveals significant commonalities and differences among the five kinds of documents, describes some special techniques that are regularly employed in SE documents and on Web pages, and points to useful design considerations and recommendations. Finally, the survey provides perspective on the important issue of content reuse and content management systems.

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