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Title: The Structure and Dynamics of Interactive Documents

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Introduction

Advances in information technology continue to accelerate as the new millennium approaches. With these advances, electronic information management is becoming increasingly important and is now supported by a seemingly bewildering array of hardware and software whose sole purpose is the design and implementation of interactive[1] documents employing multimedia[2] applications.

Multimedia memory and storage applications such as Compact Disk–Read Only Memory (CD-ROMs) are already a familiar interactive tool in both the entertainment and business sectors. Even home enthusiasts now have the means at their disposal to design and produce CD-ROMs. More recently, Digital Video Disk (DVD) technology is carving its own niche in these markets and may (once application "bugs" are corrected and prices are lowered) eventually supplant CD-ROM technology.

CD-ROM and DVD are not the only memory and storage applications capable of supporting interactive media. External, high-capacity drives and disks such as the Iomega© *zip*® and *jaz*® are also useful platforms for launching interactive documents without the need for additional hardware such as CD-ROM "burners" and copiers. The main drawback here, however, is the relatively high unit price per disk when compared to the unit cost of CD-ROMs.

Regardless of the application chosen, there are fundamental structural characteristics that must be considered before effective interactive documents can be created. Additionally, the dynamics of interactive documents employing hypertext links[3] are unique and bear only slight resemblance to those of their traditional hard-copy counterparts. These two considerations form the essential content of this paper.

[1]Traditional hard-copy documents such as books, magazines, and reports are interactive in the sense that they too are designed, produced, and read or studied. However, this is where their similarity to electronic interactive documents ends. In the world of new information technology, interactive documents are never static. They expand or even retract according to user needs or interests, and the amount of true interaction is limited only by user participation.

[2]In this context: charts, tables, text, graphics, digitized photographs, animation, video clips, sound, etc.

[3]Electronic links or connectors that allow users to freely access and navigate through the various elements of interactive documents.

1.0 Structural Components

1.1 Organizational Structure

In virtually any endeavor, good planning is a key to success. This is especially true when the task at hand is laying the electronic foundation for interactive documents employing multimedia applications.

The inherent complexity of interactive documents dictates that great care be taken in the planning and organizational stages or there is a risk of defeating the essential purpose of the document itself, and in the process, causing users to become confused and frustrated at hypertext pathways that seem haphazard and do not allow easy navigation from one element to another. To prevent such occurrences, certain structural concerns must first be addressed, including:

- establishing a starting or entry point;
- promoting information logic flow;
- ensuring logical progression to greater detail;
- allowing multiplicity in access routes;
- creating menu pages;
- including a reading software; and
- deciding whether tutorial, help, reference, legal, or update sections are necessary.

1.1.1 Starting or Entry Point

Every document (hard copy or interactive) must have a starting or entry point. In the traditional sense, this could be as simple as the act of opening a book's cover.

However, there are no covers to grasp or physical pages to turn in interactive documents. Because of this, the starting or entry point is the primary access users have available to navigate[4] through the document. With this considered, it is easy to gauge the relative importance of the starting or entry point in interactive documents.

[4]Navigate: "to follow a planned course on, through, and to."

In most interactive documents, the starting or entry point file is created using existing graphics or desktop publishing software and comprises a photograph or illustration upon which appropriate text is overlain. Hypertext links are defined through the use of buttons, or words or phrases highlighted in a color or colors at variance with the remainder of the page's text. The "Start" page (Figure 1) is then printed as a Portable Document File (PDF) and the links are activated, providing users with easily navigable electronic connectors to the next document layer or layers.

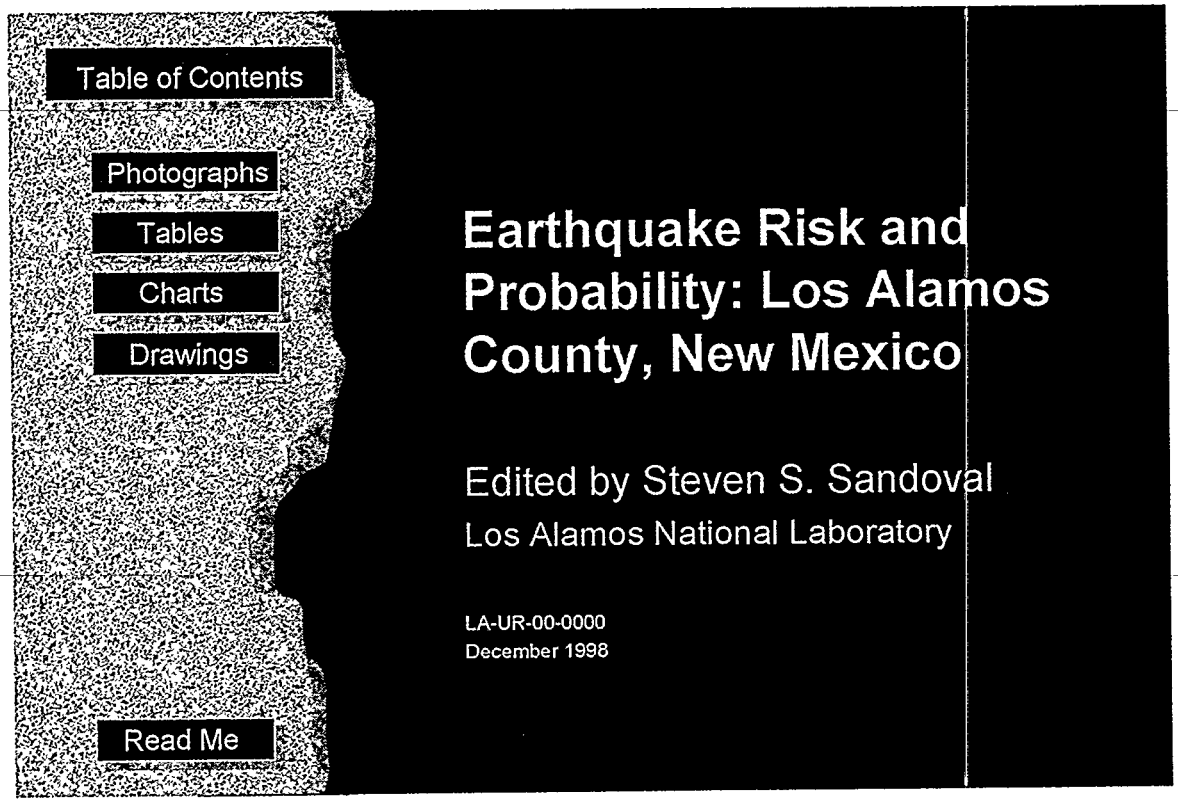


Figure 1. Sample Interactive "Start" Page.

In Figure 1, the hypertext links are the buttons arranged in columnar fashion on the left side of the page. The "Table of Contents (TOC)" button[5] is the primary user access point and is given a slightly larger size and ascendant position for emphasis. The secondary buttons directly below the "TOC" button allow users to access specific archived images or graphics immediately, in a hypertext jump that essentially bypasses the "TOC" and nonspecific text passages. The "Read Me" button at the bottom left of the page provides a link to a text file that outlines any legal, copyright, or trademark issues users should be aware of.

[5]Depending on the specific context of a given interactive document, the "TOC" button could be labeled as the "Main Menu" button, or anything else that makes good navigation sense to users. Additionally, only two link buttons are absolutely necessary here, a "TOC/Main Menu" button and a "Read Me/Disclaimer" button.

1.1.2 Information Logic Flow

For interactive documents to best serve their true purpose, information must flow in a logical fashion throughout the document, regardless of the given direction of that flow. This is particularly true of larger, multimedia documents comprising thousands of files with numerous (sometimes hundreds) of hypertext links bridging those files. There are four primary navigational/logic flow structures (Figure 2) used in interactive documents:

Linear

Users navigate sequentially from one page or information cell to another.

Hierarchical

Users navigate along the branches of a tree-type structure shaped by the natural logic of the content.

Nonlinear

Users navigate freely through the content of the document without predetermined routes.

Composite

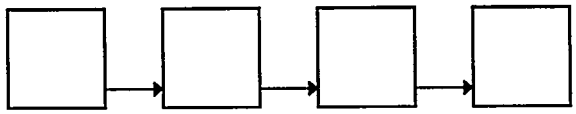
Users navigate freely in a nonlinear fashion, but are constrained to linear presentations of graphics, video clips, or critical information/data of a hierarchical nature.

1.1.3 Progression to Greater Detail

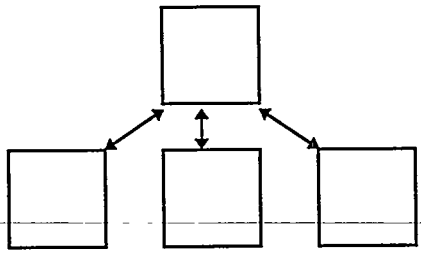
Concurrent with establishing good information logic flow is maintaining progression toward greater and greater detail within the context of that information. Multimedia and hypertext dynamics provide users with power and freedom in terms of movement in, through, around, and about interactive documents.

Although it is important to allow users the right to exercise free choice, too much freedom may cause user confusion or a breakdown in overall content integrity. To prevent this, information and content in interactive documents should be organized along major subjects and data points, with users branching outward from these key areas to greater detail and depth.

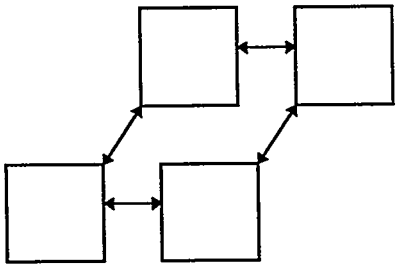
Figure 2. The Four Primary Navigation/Logic Flow Structures (simplified).



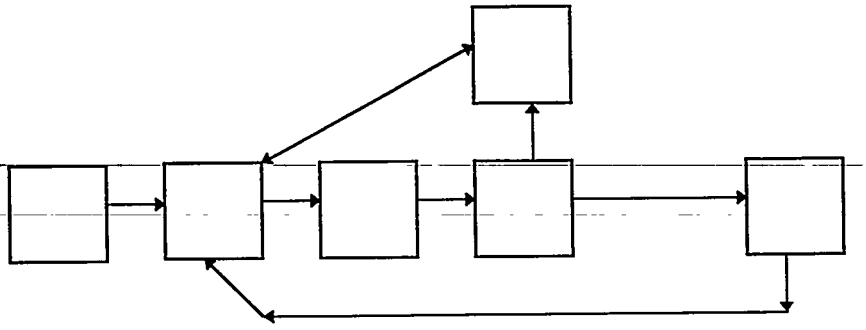
Linear



Hierarchical



Nonlinear



Composite

1.1.4 Allowing Multiplicity in Access Routes

The hypertext links in interactive documents provide users with quick and efficient means of accessing information. At the same time, users may not be interested in the total content of a given document, but only in those areas they find interesting or important in terms of information or data. Understanding this fact is often the key to success in developing interactive documents.

Obviously, main access routes (link paths) in interactive documents are essential departure points that facilitate user navigation. To a certain extent, these primary access routes are dictated by the content of the document itself in a parallel of the old design adage, "form follows function." But allowing access routes to be determined solely by such parameters can, once again, prove counterproductive.

Once the main access routes are established, subsidiary paths must be developed. These secondary or tertiary links allow users to target specific information while bypassing data deemed irrelevant or uninteresting. This does not mean that the document's main content links are ignored or discarded. On the contrary, if link multiplicity is truly effective, the user can navigate back to the contextual core swiftly and freely or choose instead to navigate toward greater informational detail without confusion or detrimental impact to the overall integrity of the document.

1.1.5 Creating Menu Pages

If hypertext links are the digital pathways of interactive documents, then menu[6] pages (Figure 3) are the departure stations for those pathways. As such, their design and construction must follow many of the same parameters as those addressed in developing start pages since the functions of both are similar in nature.

Unlike start pages however, menu pages provide users with more detailed, content-oriented information items on how to navigate to specific topics, data collections, or areas of prime interest. Menu page link items are often enclosed by boxes, circles, or are designed as push buttons or dials like those found on radios or other types of electronic equipment. These include text that directs users to "Go To," "See Illustrations," "Play Video," or "Quit Document." If space is a concern or design considerations dictate, these link item titles are often shortened to simply read "Go," "Illustrations," "Video," "Quit," and so on.

[6]Also known as menu screens.

Menu pages frequently employ hierarchical logic flows since this approach makes the most navigation sense to users. First, a "Main Menu" page is created. This, in turn, establishes links to a second level of menu screens that deals directly with the document's content and provides links to additional menu pages with more specific information links and, if necessary, to even more detailed menu screens. However, it is good to remember here that more is not always better, particularly if users become confused or distracted.

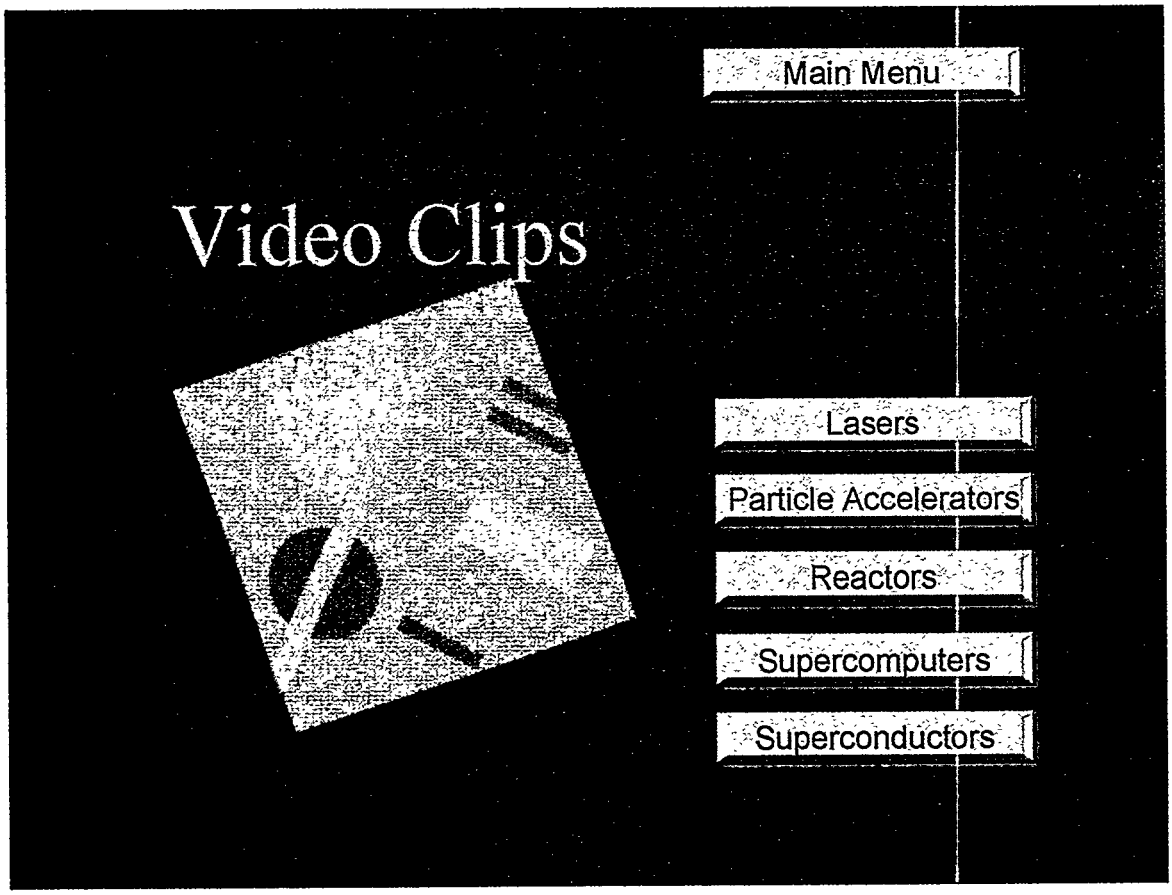


Figure 3. Sample Interactive "Menu" Page.

1.1.6 Including a Reading Software

Interactive documents are not created in a vacuum. Their planning, design, construction, and overall development are for one purpose, and one purpose only—to serve users. Even the most painstakingly designed and flawlessly executed interactive documents are essentially useless if their intended audiences (users) cannot read them.

Fortunately, PDF documents are the rule rather than the exception today. Most users employ software such as Adobe Acrobat Reader™ or Adobe Acrobat Exchange™ to read or otherwise manipulate interactive documents constructed using PDF formats.

This fact notwithstanding, most authors include the most recent version of an appropriate reading software as a downloadable attachment to their interactive documents. This ensures that users will, in fact, be able to read and navigate documents even if current PDF reading software is not loaded on their systems.

1.1.7 Deciding Whether Tutorial, Help, Reference, Legal, or Update Sections are Necessary

Despite their similarities in overall structure, no two interactive documents are the same—designs, contents, development paths, and audiences differ, sometimes widely. One document may contain volumes of periodically updated technical data, while another may contain only brief text passages linked to a series of photographs or drawings. Another interactive document may be targeted toward an audience that is highly knowledgeable regarding existing trends in new information technology and its attendant software. A totally different audience may know little about the technology or its software or peripherals, and will probably require assistance in reading and navigating the document. The possibilities are limitless. That is why decisions regarding the inclusion of tutorial, help, references, legal, or update sections are best left to authors themselves.

Tutorial Sections

Tutorials allow users to follow step-by-step instructions on how to navigate through interactive documents, including start pages, menus, and a range of hypertext links. They provide a useful means for learning interactive tasks initiated using a mouse, keyboard, touch screen[7], electronic stylus, or other device.

Tutorial sections are most often included in interactive documents when users (the target audience) are unfamiliar with information technology employing a multimedia approach and hypertext links. They can also be included when the document contains reading software.

[7]Touch screens are monitors employing a special (textured) coating across the glass face that is pressure-sensitive. This coating allows users to navigate through an interactive document at the simple "touch of a finger."

Help Sections

More often than not, help sections contain a variety of topics relating to software and hypertext navigation issues. They provide instant, easy access to answers about those issues and provide general information on document structure and format as well. It is generally a good idea (as well as a basic courtesy) to provide interactive document users with a help section, regardless of its size or overall level of detail.

Reference Sections

Reference sections are exactly as the name implies, notes that direct users to additional information or sources. More technical or information-intensive interactive documents will probably require reference sections. Other less-involved documents probably won't.

Legal Sections

In most interactive documents, legal sections are included as brief "Read Me" text files that outline considerations dealing with intellectual or software property law, including copyrights, use of trademarks, and so on. Regardless of a given document's size or content, most authors include a legal section to notify users of the legal boundaries governing the use (or misuse) of the document or associated software.

Update Sections

Update sections are generally found in interactive documents where new data or information is added on a regular basis. Generally, these are documents that, once again, are highly technical in nature or more information-intensive. Update sections usually list newly arrived information or data, describe any changes in document structure, and apprise users of any hypertext pathways that have been added to facilitate navigation.

2.0 The Dynamics of Interactive Documents

2.1 Common Pitfalls

2.1.1 "Data Dumping"

Any reasonable analysis of the dynamics of interactive documents should be prefaced by a discussion of the most common misconception held by newcomers to the realm of interactivity and multimedia. This, in essence, is the belief that interactive documents are constructed simply by downloading copious amounts of scanned hard-copy page files onto a storage disk. Online editor William Horton[8] calls this approach "data dumping."

[8]William Horton, "The Wired Word: Designing Online Documentation," *Technical Communication,* pp. 258–263, (May 1992).

Data dumping has little, if anything to do with true interactivity. There is questionable value added (beyond a back-up capacity and certain storage and portability issues) by merely providing users with electronic copies of existing word-processing or spreadsheet files. At the very least, data dumping implies a novice's misunderstanding of the structure, dynamics, and advantages of well-planned and executed interactive documents employing multimedia.

By the same token, if the data-dumped word-processing or spreadsheet files mentioned above were:

- carefully formatted and edited using a suitable desktop publishing software;
- linked using effective hypertext pathways and well-designed menu pages; and
- combined with appropriate multimedia applications;

then the end result would no longer be a data dump but a true interactive document that encourages user participation and allows easy access to specific data or areas of interest. This point cannot be emphasized strongly enough to those individuals, agencies, or businesses contemplating a shift from traditional hard-copy documents to interactivity.

2.1.2 Undermining Document Integrity

Failing to grasp the importance of document integrity is another common pitfall those unfamiliar with interactive document dynamics fall prey to. In some instances, a manager or client will insist that certain sections of the document be deleted, altered, or expanded without fully understanding the potential damage such actions may cause, including:

- broken (inactive) links;
- disrupted logic flow;
- corrupted cross references; and
- an overall weakening of interactivity (with a resulting degradation of user friendliness).

In other words, when perfectly functional and well-designed interactive documents have their structural components violated, their integrity degraded or destroyed, and their dynamic functions ignored, then the end result is data dumping in reverse. No one wins in this scenario—least of all the user.

This is not to say that interactive documents cannot be altered or expanded. Quite the opposite is true. Interactive documents are truly "living documents" that grow, expand, or retract according to the needs or dictates of those they serve. The key here is

understanding how important document integrity is to document effectiveness. Any changes should reflect this knowledge and should remain within the parameters of document dynamics as a whole.

2.2 Comparing Document Dynamics

Comparing some of the relative advantages and disadvantages (Table 1) is one means of gaining an understanding of the dynamics of interactive documents, traditional hard copies, and data dumps.

Table 1. Comparison of Relative Advantages and Disadvantages.

Feature	Interactive	Hard Copy (paper)	Data Dump
Media	Open-ended, including text, graphics, video, photos, sound, and animation.	Restricted to text, photos, and graphics.	Restricted to text, photos, and graphics.
User Participation	Active (users make decisions regarding information access and navigate freely).	Passive (users restricted to static information access and must navigate through predetermined structure).	Passive (users restricted to static information access and must navigate through predetermined structure).
Storage	Minimal cost and space requirements.	Moderate-to-high cost and space requirements	Minimal cost and space requirements.
Shipping	Minimal packaging/shipping costs.	Relatively high packaging/shipping costs.	Minimal packaging/shipping costs.
Production Costs	Moderate-to-high at "front end;" low thereafter.	High.	Moderate-to-high at "front end;" low thereafter.
Ease of Use	Low initially; high thereafter.	High.	Low initially; high thereafter.
Adaptability	High.	Low.	Low.
New Market Potential	High.	Low-to-moderate.	Low-to-moderate.
Data/Information Access	Instantaneous.	Slow.	Slow-to-Moderate.

2.2.1 Interactive Documents in the Workplace

Interactive documents employing multimedia are beginning to supplant the less-efficient and more costly traditional hard copy approach in today's workplace. Current business applications include:

- training materials,
- presentations,
- marketing and advertising materials,
- product demos,
- reports,
- databases, and
- catalogs.

Additionally, as more companies, businesses, and institutions perceive the advantages of interactive dynamics (and set-up costs decrease), more in-house and "third party" applications will be developed to streamline operations, lower costs, and increase efficiency.

3.0 Conclusion

There are significant changes occurring in the way people access, learn, and interact with information today. The old ways of managing information can no longer keep pace with new developments in information technology. As a result, more and more individuals, businesses, and governmental agencies are seeking new, less-costly ways of disseminating and processing information.

At the forefront of this information "revolution" are interactivity and multimedia. Why? Because these approaches are, in essence, creating an entire new syntax for communicating. They can transport users senses beyond the flat printed page into a realm of sight, sound, and touch where thought, not reaction, is necessary for comprehension.

Interactive documents are only one small part of this revolution. A much broader world of new multimedia applications is already on the horizon of the vaunted "information superhighway," including virtual reality which may, in time, become the information medium of the future.

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