Notes and Communications

*Hyper*RAD™: *Improving Access to the* Rules for Archival Description *using Hypertext*

by ELAINE G. TOMS and WENDY DUFF

The *Rules for Archival Description* (*RAD*),[1] published in 1990, was the result of a three-year concerted effort by Bureau of Canadian Archivists' Planning Committee on Descriptive Standards to create a code for standardizing archival description. Although only the rules for multiple media fonds have been published to date,[2] the concept embodied in *RAD* has already been adopted by the Canadian archival community and is currently in use nationally.

RAD, like all manuals, provides an encyclopedic volume of detailed rules written for the expert, but widely used by the neophyte. To facilitate *RAD*'s acceptance and use, training and a means of providing rapid and convenient access to the information embodied in the rules is essential. In 1973, James Martin argued that users must be provided "with information only when they need it . . . in the clearest and most digestible form."[3] Unfortunately, *RAD*'s linear format combined with its static organization due to its presentation solely in a printed paper medium, creates an obtuse and sometimes exasperating document. However, many of these difficulties which confront the novice user unfamiliar with a formal set of instructions for archival description can be ameliorated by the use of hypertext software.

This paper will describe the structure and application of *RAD*, indicate the major difficulties of the printed paper medium for *RAD* and demonstrate how these difficulties can be overcome in an electronic format. Finally, the paper will examine briefly the possible electronic solutions, and describe the blueprint for an electronic prototype, which is currently under development by the authors.[4]

Rules for Archival Description — *its Structure and Use*

RAD is a numbered set of rules consisting of the following sections as outlined by its Table of Contents in **Figure 1**:

1) A preface and introductory rules that set out the use and applicability of *RAD*;

2) Part I (chapters 1-11), which contains rules for describing archival material:

© All rights reserved *Archivaria* 34 (Summer 1992)

Chapter 1 is a general section containing basic rules for the description of all types of archival media. Chapter 2 contains rules for describing an archival fonds that consists of more than one broad class of material, e.g. a fonds consisting of both graphic and textual material, while Chapters 3-9 individually contain the rules for specific media. Chapter 11 contains special rules for describing material at different archival levels, e.g. fonds, series, file and item;

3) Part II (chapters 21-26), which consists of rules for determining and establishing headings (access points) by which the descriptive information is retrieved; and

4) Appendices, which include rules of general applicability (abbreviations, capitalization and numerals) that must also be consulted when creating a description. The appendices also contain the glossary which shows how *RAD* defines a term.

Each chapter in Part I consistently groups and numbers the rules into nine descriptive areas, using an organizational pattern illustrated by the example for textual records in **Figure 2**. In addition, each of these areas contains rules for creating data elements, specifies prescribed punctuation for the elements and includes examples to illustrate particular applications. The general rules (.0) for each chapter contain the chief source of information[5] and prescribed sources of information[6] used to select the data elements for the broad class of material.

Creating Archival Descriptions

Creating an archival description consists of two functions:

1) Constructing representations or surrogates of the records; and

2) Establishing headings or access points to those representations.

These descriptions consist of data elements grouped into as many as nine descriptive areas, each containing information about specific characteristics of the material. The nine areas are arranged in a set structure with accompanying punctuation, as depicted in **Figure 3**.

To create a descriptive element, archivists must first consult the specific medium chapter, i.e., Chapter 3-9. Within any of these chapters, a multitude of relevant rules may have to be considered, many of which refer to the general rules provided in Chapter 1 and Chapter 2. Furthermore, completing the description may require reference to the multilevel rules in Chapter 11, the appendices for capitalization, abbreviations, etc., and the preliminary rules. However, some rules may not be pertinent and whole areas of the manual may be extraneous for some levels and in selected cases.

For example, archivists faced with supplying the title proper for a fonds, must examine rule 3.1B in the Textual Records chapter, rule 2.1B in the Multiple Media Fonds chapter, and 1.1B in the General Rules chapter. In addition, they may need to check the glossary for definitions, use Appendix A to determine capitalization, examine the rules for the chief/prescribed source(s) of information, and note the correct punctuation. In this particular case, the rules for formal title need not be considered and Appendices B (Abbreviations) and C (Numerals) can be ignored. The challenge for archivists is to locate the appropriate rule among the myriad of rules.

Problems with the Printed Paper Medium of RAD

Without a doubt, *RAD* is a very challenging document for the uninitiated. Its layout and complexity is intimidating to the novice and can be daunting to the sophisticated but casual user. The archival community needs a manual in a format that masks *RAD*'s complex structure, yet simultaneously presents all relevant rules on a 'need-to-know' basis. In addition, for efficiency, it requires enhanced navigability and improved access that only an electronic format can offer.

The effectiveness and efficiency of printed paper documents versus electronic documents for readability, comprehension, ease of use, etc. has been the subject of much discussion and research, and is beyond the scope of this paper.[7] Instead this paper will consider three limitations of printed paper documents, which are of specific applicability to *RAD* and demonstrate how they can be overcome by an electronic format:

1) *RAD*'s layout and organization, as described previously, may impede the progress of beginners who must master the structure before they can efficiently use the document. In an online version, the structure becomes invisible to the user as the computer manipulates the structure and delivers only relevant 'chunks' of information.

2) *RAD* is not meant to be read sequentially. As one commentator has observed, "A good manual is not a narrative . . . .Nobody ever reads a manual cover to cover — only mutants do that."[8] Instead, the archivist skips and scans the document, identifying relevant rules and noting appropriate pages. To locate all applicable rules for one data element, the archivist often needs the dexterity of an octopus.

The cumbersomeness of a textual manual like *RAD* is overcome by an electronic version, which automatically makes connections among relevant 'chunks' of information and displays all related or associated items. Access pathways based on usage of the document are created via menus, and other hierarchical and associative structures, thereby enhancing navigation and browsing among the rules.

3) Typical of printed paper documents, *RAD* has severe limitations for access. An archivist has the option of: (a) reading sequentially, page-by-page; (b) starting with the table of contents to locate a chapter or section and then leafing through the text; (c) browsing the manual by scanning headings; or (d) locating the appropriate rule by serendipitously flipping open the book and browsing the pages. None of these techniques ensures precise retrieval. Physical elements of the printed paper medium serve more as signposts and are only clues to accessing the relevant information. Even an index, when it becomes available, would locate only a specific word in the text of the manual. Gaining access to the relevant rules is thus laborious and time-consuming.

In an electronic format, access is almost instantaneous. The novice user should be able to find information in the electronic version as quickly as the expert user does in the printed paper document.[9] The electronic medium obviates the need to scan the table of contents, or browse the document randomly in order to find a needed rule. The system can retrieve information by (1) direct access to the chapter level, the descriptive area level or even to specific rule(s); (2) numerous entry points using standard boolean operators; (3) keyword and term indexing;[10] (4) use of truncation[11] and proximity searching;[12] and, (5) controlled or 'intelligent' browsing.

An interactive electronic format is the ideal, indeed the only realistic solution. Nevertheless, overcoming only one limitation, e.g., rapid access, will not optimize the full capability of an electronic *RAD*. All three limitations must be surmounted for the archival community to adopt a model which enables the effective and efficient use of an electronic *RAD* to come to pass.

Electronic Options

A standard paper-based text can be converted to electronic form by choosing one of the following options: (1) word-processing software, (2) standard file managers or database management system software, or 3) hypertext-based software. Using word-processing software is a straightforward and simple solution which merely produces a computer file in a conventional sequentially-read format. In this option, the paper version is exchanged for the computer screen, a most undesirable form for both manipulation and use. Many of the disadvantages of the paper-based format are retained, and little of the power of the electronic format is harnessed.[13]

Neither a sophisticated relational database nor a standard file manager is an adequate tool to manipulate a full-text document like *RAD*. However, textual database software features many options for improved navigation and access that are foreign to word-processing packages, and enables the information to be queried, manipulated and selectively displayed. Retrieval is enhanced, but results are still based on keyword/term queries. The results still must be scanned and evaluated, and probably searched again before the most appropriate and desirable response is obtained. Hypertext software, however, can further improve the textual database approach.

What is Hypertext?

Hypertext was originally postulated as an abstract concept by Ted Nelson to describe a system of linked 'chunks' of text connected in a non-linear fashion.[14] In a hypertext document, information, organized through a series of links and nodes[15] in a network or web-like structure, is configured in much the same way as human thought processes filter the document's content.[16] Instead of being limited solely to either a sequential or an hierarchical arrangement typical of many menu-driven systems, associated nodes may be connected across hierarchies. The basic premise behind hypertext is that it emphasizes "the relationships between ideas rather than isolated facts."[17]

The links in a hypertext document are physical links designed by the 'composer'[18] to mark pathways through the document based on the use and potential use of the document. These links are incorporated by the software to ensure that manoeuvring from node to node takes place automatically. The user traverses the document by selecting from a variety of buttons or icons, which may open a window containing further amplification, an explanation or graphics; skip to an associated section of the document, a node; or issue a command to the system. Implementations differ from software to software, but the basic concept of non-sequential text divided into linked 'chunks' is always employed.

Not all documents are good candidates for hypertext. Manuals and other forms of highly structured documentation meet the generally accepted minimum criteria used to evaluate

a paper-based text for its hypertext potential. These criteria, called the "Golden Rules of Hypertext" require that

—there is a large body of information organized into numerous fragments;

—the fragments relate to each other, and

—the user needs only a small fraction at any time.[19]

Hypertext for RAD

Does *RAD* meet the above criteria? *RAD* presents a body of information, a set of instructions for archival description, organized into chapters, areas, sub-areas and rules. These sections relate to each other in four ways: (1) the rules apply to a specific document type, e.g., moving images; (2) the rules apply to a specific area of description, e.g., custodial history; (3) the rules reference the information in a related rule, e.g., rule 2.4B1 which states "Give the date(s) of creation as instructed in 1.4B"; (4) the rules describe an attribute of an associated rule, e.g., special rules for capitalization and punctuation of Title Proper. As with most manuals, archivists only use a portion of *RAD* at any one time. For example, a query about general material designation for a multiple-media fonds requires only the basic rule 2.1C and rule 1.1C. In addition, *RAD*'s highly controlled, complex, but consistent format, partially illustrated by **Figure 1** and **Figure 2**, simplifies its conversion to hypertext format.

*The Hyper*RAD™ *Structure — a Blueprint*

Designing a hypertext system does not resemble the process for designing a relational database; there is neither a formal data definition nor a structured design schema. This does not mean, however, that a hypertext document has no blueprint. In developing a hypertext system, a complex network of organizational and referential links are interwoven throughout the document. The key to creating this network is having a comprehensive understanding of all potential user pathways. For *RAD*, this means understanding which rule or rules an archivist will need, and in what order.

In designing HyperRAD™, *RAD*'s structure has been fully exploited The premise behind HyperRAD™'s design is that archivists begin the descriptive process by consulting a descriptive area within a specific media chapter. The user interface, therefore, adopts a hierarchical menu approach. For example, as illustrated in **Figure 4**, the archivist selects from a screen similar to the paper-based table of contents. From this node, the archivist can access the rules for any type of medium. (**Figure 5** illustrates the screen selection for Textual Records.) Subsequently, within a media chapter, the archivist selects the rules for any specific descriptive area, e.g., Title and Statement of Responsibility as depicted in **Figure 6**. Rapid menu selection varying between two or more menus, facilitates immediate access to the relevant information on one screen in a way that can not be replicated in a printed paper-based medium.

Initially *RAD* was divided into 'chunks' or nodes based on its semantic units, that is, the rules for each descriptive area as illustrated in **Figure 7**. A node is no more than a screen of text, each node is linked, not according to the physical organization of the printed paper manual, but on the associative relationships between and among those

semantic units. For example, rule 3.1B1, the rule for formal title proper of a textual record, is linked to the general rules 1.1B1-1.1B3 for formal title proper. The formal physical structure of the printed paper medium, e.g., rules, their numbers and paragraphs is also preserved. Hence, the screen image for a single rule appears in much the same way as it does in the paper text.

HyperRAD™'s capabilities and flexibility provide finger-tip control at the rule level. HyperRAD™ not only displays rules for each data element but also enables immediate access to the rules for (1) capitalization, (2) use of numerals, (3) chief and prescribed sources of information, (4) abbreviations and (5) punctuation — each of which is contextually related. Each of these options is represented by a button or 'hot key' on the bottom of the screen as illustrated in **Figure 7**. For example, if the archivist was reviewing the rules for Title Proper, then the rules for capitalization, as they affect only the Title Proper will be available on demand. At the same time, the archivist can examine an example that shows how the rules have been applied, and we plan to include a facsimile of that document, with the same tight control.

Definitions which appear both in the glossary and in other sections of the text are similarly treated. Each occurrence of a term which requires further explanation is linked to its definition. Thus, the archivist needs only to 'point and click' (as shown in **Figure 8**) and a window will display additional information amplifying the term, thereby ensuring its correct application.

The need to refer simultaneously to several sections of the manual is one of the major frustrations confronting an archivist who uses a printed paper-based version of *RAD*. HyperRAD™ links the pertinent rules in material specific chapters to the General Rules in Chapter 1. For example, to determine the title proper for a textual record, the archivist first selects and displays the relevant rules in the Textual Records chapter, and then, if required, only needs to click a button to display the corresponding general rules.

One of the curiousities of *RAD* which was initiated by its model, *Anglo-American Cataloguing Rules*[20] is the propensity to put snippets of valuable information in obscure sections of the manual. For example, the explanation for the word "prominently," is buried in the general introduction. HyperRAD™ will continue to 'hide' this explanation, but each rule containing the word "prominently" will also readily display the explanation. As we have already mentioned, the basic foundation of our design has been presenting information only on a need to know basis.

In the printed paper-based version of *RAD*, the archivist uses the Table of Contents, dctailed chapter contents, page headers, and rule numbers to gain access to a specific set of instructions. All of these features are replicated and enhanced in HyperRAD™. In addition, the use of 'buttons', or 'hot keys', facilitates forward and backward movement between rules. The linear format of the paper-based document is replicated only within a single descriptive area, enabling the archivists to still 'page' through the various rules.

But, navigation and access are strengthened by two additional features: (1) a chart which presents a global view of the hypertext structure, and (2) the ability to backtrack, seemingly effortlessly, to a rule already perused, all with the simple click of a button. These features enable the archivist to dive deep into the system, bypassing the labyrinth of links embedded in the HyperRAD™ structure and ensure that the archivist does not

get lost in 'hyperspace.' HyperRAD™ offers additional access using basic keyword-searching with boolean operators, for the expert who wants to parachute onto a specific rule. Boolean capability combined with hypertext navigational cues and signals will make HyperRAD™ a powerful tool for archivists unfamilar with the structure of *RAD*.

All institutions may not utilize *RAD* in quite the same way. For example, some repositories only describe a fonds at the fonds level, while others may describe down to the series, file or even item level. Institutions may also have differing philosophies and policies which will influence the options and alternatives that are selected. One of the 'authoring' features of HyperRAD™ which appends notes at the rule level, provides institutions with the opportunity to incorporate institutional policies and procedures governing specific applications, interpretations or usage restrictions. This feature is analogous to the printed paper's marginal notes, or the separate procedural manuals which institutions will have to develop and maintain as they begin to use the printed paper based *RAD*.

Because of the archival community's familiarity with the paper format, the preservation of the structural integrity and content of the paper version is essential. For example, rule numbers, headings and sub-headings must be retained. Nevertheless, some information is extraneous and irritating when incorporated in an electronic text. Empty rules which serve as 'see' or 'see also' references in a paper-based text, are superfluous in the electronic format. For example, the text of rule 3.0D states only "See 1.0D." In each case, HyperRAD™ omits the empty rule and displays only the target rule. In other cases, the text must be amplified or modified. For example, many rules are missing a key heading or sub-heading which provides a prime source of access and serves as a point of orientation for the archivist. Headings are created based on the substance of the rule. For example, rule 3.1B2 will be assigned "Formal Title Proper — Abridging," as illustrated in **Figure 9**.

Status of the Project

The HyperRAD™ prototype is still under development. When finished, it will incorporate the equivalent of chapters one and three of *RAD* plus the preliminaries and the appendices. In addition, we shall be evaluating the cost-effectiveness of developing HyperRAD™ for general distribution, and test the efficiency of HyperRAD™ on novice and expert users. The project is expected to be completed by December 1992.

*Future for Hyper*RAD™

HyperRAD™ has considerable potential for improving the practice and application of archival descriptive standards beyond the mechanical presentation of a set of rules. There are four potential prospects for HyperRAD™:

1) *Addition of expert system capability*

In the current proposed version of HyperRAD,™ the archivist must know the section in the manual to be consulted, e.g., supplied title for the title proper. Ideally, however, the incorporation of *conditional* links which depend on the level of expertise, the part of the manual being consulted, the amount of perusal time and other user-driven factors, will improve HyperRAD's™ efficiency.

2) *Interpretive manual*

Due to the complexity of the rules for archival description, an interpretive manual is essential for the archivist in order to apply the rules properly. Ideally, this should not be yet another printed paper manual that the archivist must consult. The incorporation of an authoritative and comprehensive interpretive manual in HyperRAD™ would enhance the basic text of *RAD*.

3) *Education and computer-assisted training*

Incorporating a computer-assisted training module into HyperRAD™ would provide the archival community with a powerful educational tool which would function simultaneously as archivists apply the rules. The addition of examples illustrated by images of source documents is a start. The incorporation of a training and/or tutorial system, however, using HyperRAD™ as the catalyst, would exploit *RAD*'s full potential. Archivists must not only have the option of checking rules, examining examples for guidance on applying the rules, and consulting an interpretation of them, but must also receive instructions on usage as well. Thus, HyperRAD™ should contain a comprehensive, step-by-step training system for archivists with differing levels of expertise.

4) *Integration in the automated archival system.*

As archives continue to automate their functions, the need for an electronic version of *RAD* will increase. When archives are fully automated, archivists will need to view rules as they create a machine-readable descriptive record. Integration is the key. Unless incorporated as an integral part of the architecture of an automated archival system, HyperRAD™ will become anachronistic as fast as the printed paper version.

Conclusions

RAD is a major achievement within the Canadian archival community and a landmark contribution to archival descriptive standards. The current printed paper format for *RAD*, however, forces archivists to learn complicated descriptive rules within a complex framework. In addition, the linear printed paper format limits access to key items and leads to onerous navigability. To utilize *RAD* to its full potential, and to neutralize those seemingly overwhelming difficulties of the printed paper format, an electronic medium harnessing the rich potential of hypertext and explaining the complexities of *RAD* is the only realistic solution. When fully operational, HyperRAD™ will emulate the results of other research projects in the field of hypertext application,[21] ably demonstrating the superiority of electronic documentation when applied to a manual such as *RAD*.

PART I

Description

Introduction 0-7
1 General Rules for Description 1-1
2 Multiple Media Fonds 2-1
3 Textual Records
4 Graphic Materials
5 Cartographic Materials
6 Architectural Records
7 Moving Images
8 Sound Recordings
9 Computer Files
10 Microforms
11 Multi-Level

PART II

Headings, Uniform Titles, and References

Introduction
21 Choice of Access Points
22 Headings for Persons
23 Geographic Names
24 Headings for Corporate Bodies
25 Uniform titles
26 References

Appendices
A Capitalization A-1
B Abbreviations B-1
C Numerals C-1
D Glossary D-1

Figure 1. ***RAD*'s Table of Contents**

3.0 General Rules

3.1 Title and Statement of Responsibility Area

3.2 Edition Area

3.3 Class of Material Specific Details Area

3.4 Date(s) of Creation, including Distribution, Publication, etc. Area

3.5 Physical Description Area

3.6 Series Area

3.7 Archival Description Area

3.8 Note Area

3.9 Standard Number and Terms of Availability Area

Figure 2. Rules for Textual Records

Title proper / Statement(s) of responsibility. — Edition statement. — Class of material specific details. — Date(s) of creation, or when this is not applicable, first place of distribution, etc. : name of first distributor, etc., date of distribution, etc. — Extent of descriptive unit. — Administrative history/Biographical sketch. — Custodial history. — Scope and content. — Note(s). — Standard number.

Figure 3. Generic Archival Description

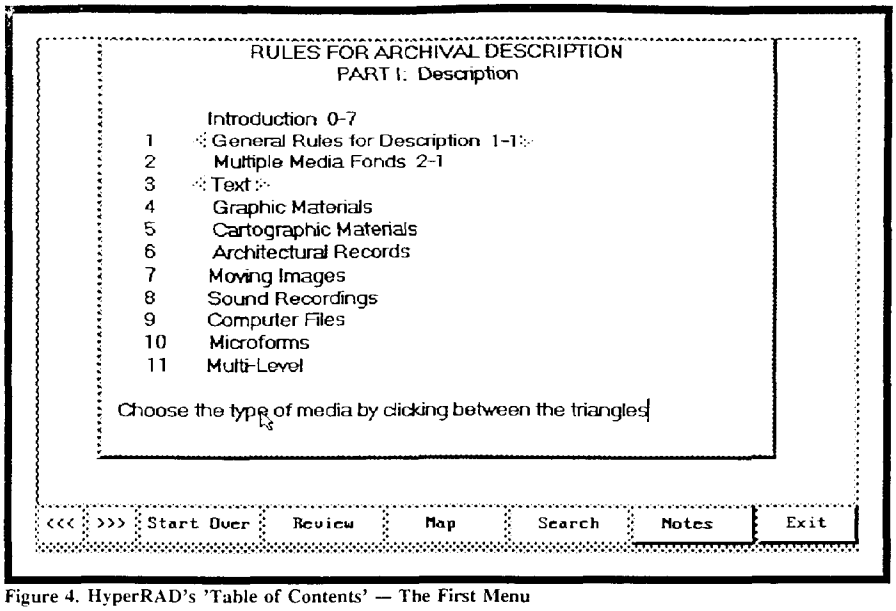

Figure 4. HyperRAD's 'Table of Contents' — The First Menu

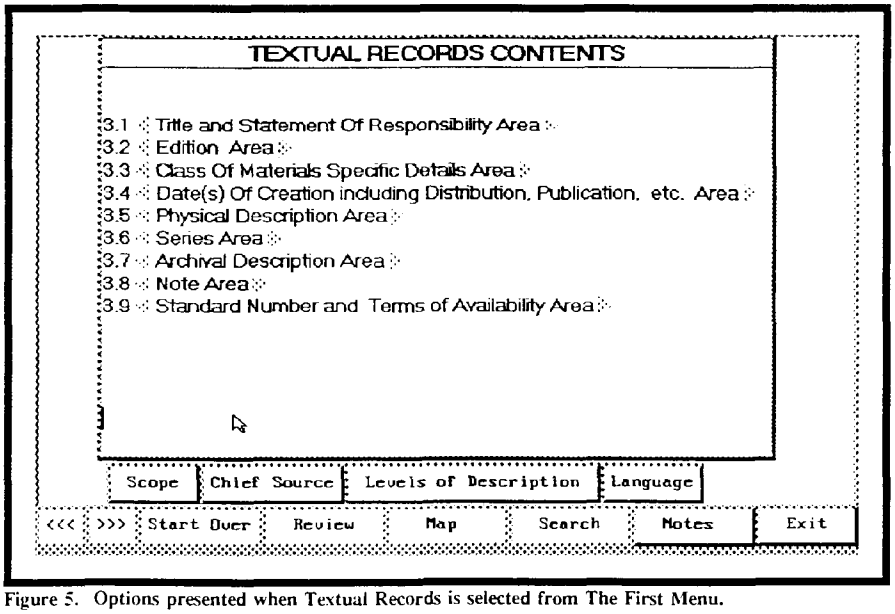

Figure 5. Options presented when Textual Records is selected from The First Menu.

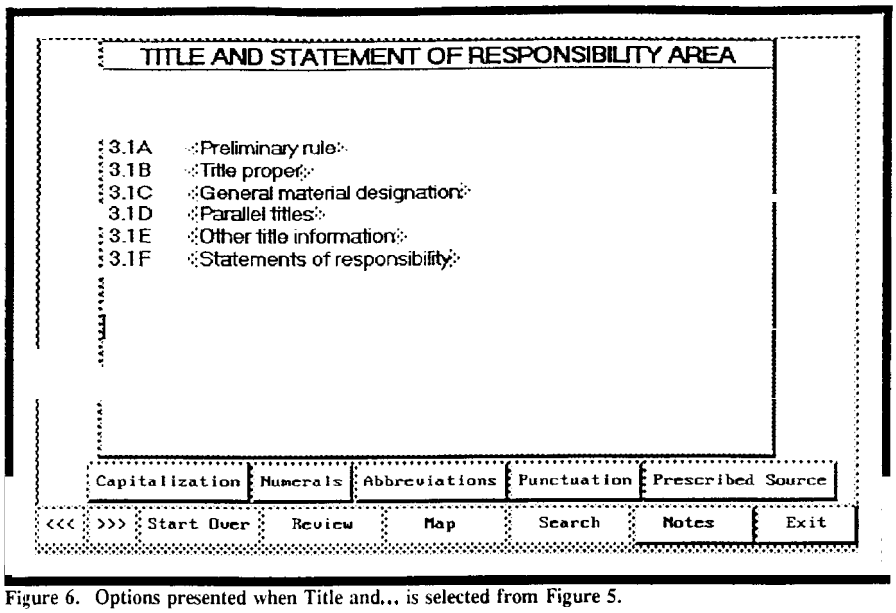

Figure 6. Options presented when Title and... is selected from Figure 5.

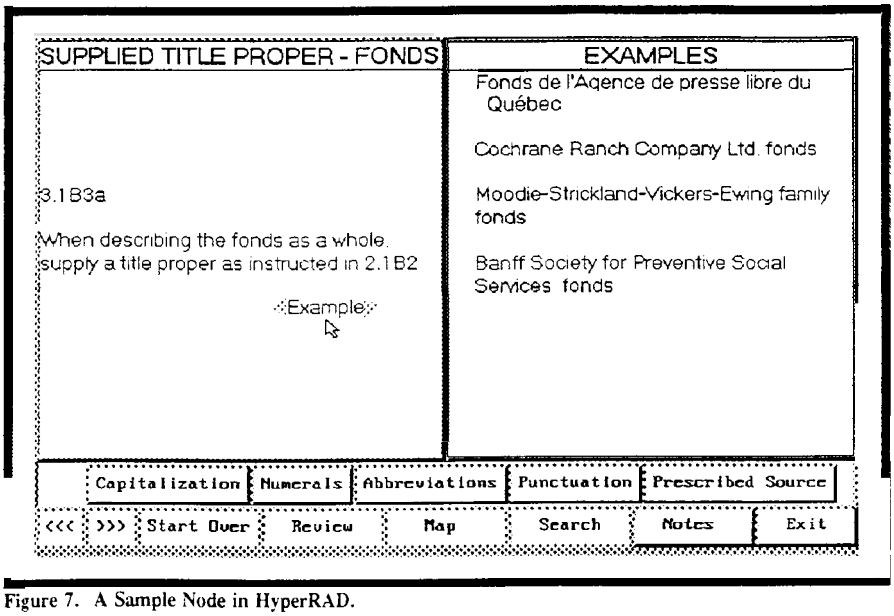

Figure 7. A Sample Node in HyperRAD.

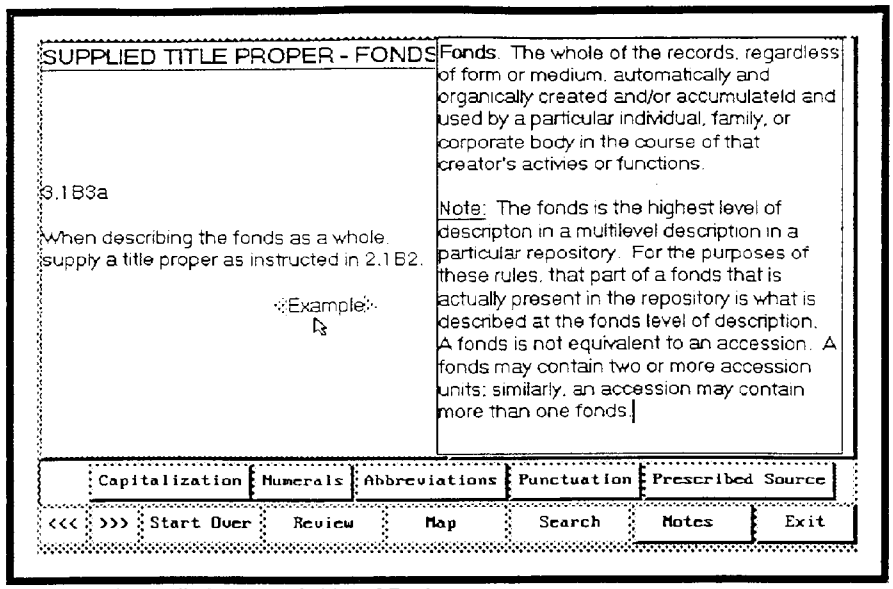

Figure 8. Window displays the definition of Fonds.

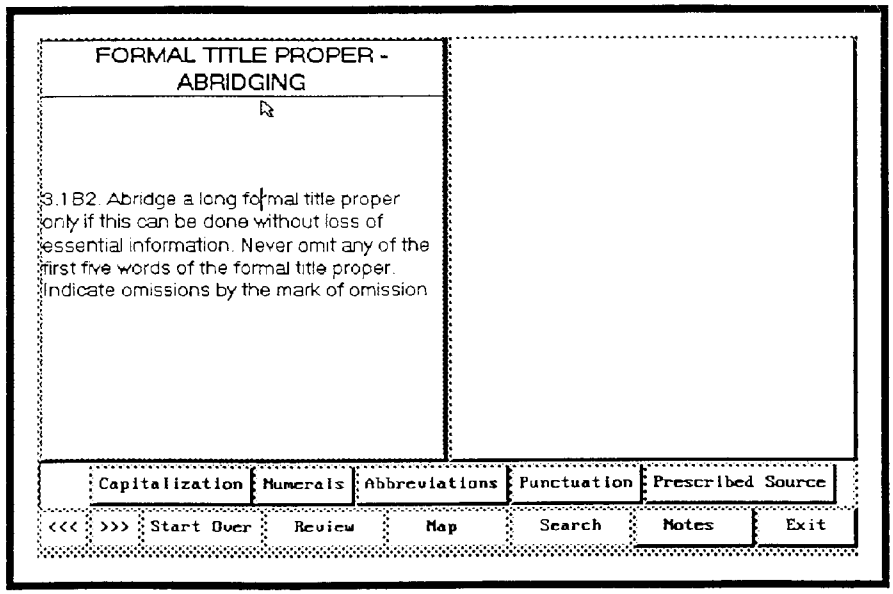

Figure 9. Adding an Heading to the *RAD*'s Rules.

Notes

1 *Rules for Archival Description/Règles pour la description des documents d'archives* (Ottawa, 1990).

2 Chapters 1 and 2, the preliminaries and the appendices, were published in 1990. Chapters 3 and 4 are expected to be published in 1992. Completion of the document is scheduled for 1994.

3 James Martin, *Design of Man-Computer Dialogues* (Englewood Cliffs, 1973).

4 This project is funded by the Council of Canadian Archives, with logistical support from Dalhousie University School of Library and Information Studies.

5 The chief source of information is an information source that is preferred when creating an archival description, e.g., a title page for a textual item, instead of the cover.

6 The prescribed source of information specifies the source(s) from which the information can be selected for a specific descriptive area.

7 For studies, consult D. Osborne and D. Holton, "Reading From Screen Versus Paper: There is no Difference," *International Journal of Man-Machine Studies* 28 (1988), pp. 1-9; J. Gould et al., "Reading From CRT Displays can be as Fast as Reading From Paper," *Human Factors* 29 (1987), pp. 497-517; John D. Gould et al., "Why Reading was Slower from CRT Displays than from Paper," *Proceedings of the CHI/GI '87 Human Factors in Computing Systems and Graphics Interface, Toronto, Ontario, April 5-9* (New York, 1987), pp. 7-11; Robert Lunn and William P. Banks, "Visual Fatigue and Spatial Frequency Adaptation to Video Displays of Text," *Human Factors* 28 (1986), pp. 457-464; Dennis E. Egan et al., "Behavioral Evaluation and Analysis of a Hypertext Browser," in *Proceedings of CHI'89* (New York, 1989), pp. 205-210.

8 John Greenwald, "How Does This #%$@! Thing Work?" *Time* 18 (June 1984), p. 64.

9 Patricia Ann Carlson, "Hypertext: A Way of Incorporating User Feedback into Online Documentation," *Text, Context, and Hypertext: Writing With and For the Computer* (Cambridge, 1988), pp. 93-106.

10 Keyword is the standard search option — by single word as defined by a set of characters which begins with a space and ends with a space, e.g. "date" and "creation" are two keywords; term-indexing permits retrieval by phrases, e.g., "statement of responsibility."

11 Truncation permits searching on a piece of a keyword or phrase. The piece is generally the left part, but may also be the ending or the middle of the word. If the question mark is a symbol of omission in the following examples, searching by "wom?n" retrieves women and women, by "archiv?" retrieves archivist, archivists, archival and so on. The ability to truncate is a software option and varies from system to system.

12 Proximity searching (also called adjacency searching) is the ability to specify how close two keywords may be in the source document. For example, specifying that date must be within two keywords of creation will retrieve any reference to "date of creation."

13 L. Price, "Using Offline Documentation Online," *SIGSOC Bulletin* 13 (1981), pp. 15-20; D. Richier and K. Thompson, "The UNIX Time-Sharing System," *Communications of the ACM* 17 (1974), pp. 365-75.

14 "Hypertext" was coined by Ted Nelson to define a system of non-linear linked sections of text in "A File Structure for the Complex, the Changing, and the Indeterminate," *Proceedings of ACM 20th National Conference,* (New York, 1965). Vanevar Bush is credited with envisioning the concept. ("As we may think," *Atlantic Monthly* 176 (1945), pp. 101-108.) For an introduction to hypertext, see Jeff Conklin, "Hypertext: an Introduction and Survey, *Computer* (September 1987), pp. 17-41.

15 Some definitions, which may prove useful in reading this section are the following: 'Node' is "a topic in a hypertext system, that is, a syntactically and semantically discrete chunk of information that can be displayed on one computer screen"; Link is a connection between two topics or nodes, "that when selected causes the other topic to appear"; 'Icon' is a visual symbol used to represent a command; 'Button' is a section on the screen which is a word or section of text, an icon or a graphic, which the user selects by using a key on the keyboard or by pointing to the button with a mouse. [William K. Horton, *Designing and Writing Online Documentation: Help Files to Hypertext* (New York, 1990)].

16 Patricia Ann Carlson, "Hypertext: A Way of Incorporating User Feedback into Online Documentation," p. 95.

17 Ben Shneiderman, "Reflections on Authoring, Editing and Managing Hypertext," Edward Barrett, ed. *The Society of Text: Hypertext, Hypermedia, and the Social Construction of Information* (Cambridge, 1989), p. 129.

18 "Composer" is used to distinguish the original author of the document from the creator of the network structure.

19 Ben Shneiderman, "Reflections on Authoring, Editing and Managing Hypertext," p.115.

20 Michael Gorman and Paul W. Winkler, eds. *Anglo-American Cataloguing Rules, 2nd ed. 1988 Rev.* (Ottawa, 1988).

21 Two key projects in this area have been the Symbolics Document Examiner, as reported in Susan T. Dumais, "Textual Information Retrieval," M. Helander, ed. *Handbook of Human-Computer Interaction* (Amsterdam, 1988), pp. 673-700; and the SuperBook system, as discussed in Dennis E. Egan et al., "Acquiring Information in Books and SuperBooks," *Machine-Mediated Learning* [in press]; and in Dennis E. Egan et al., "Formative Design-Evaluation of SuperBook," *ACM Transactions on Information Systems* 7, no. 1 (1989), pp. 30-57.