Author-generated Dublin Core Metadata for Web Resources:
A Baseline Study in an Organization

Jane Greenberg
University of North Carolina at Chapel Hill
janeg@ils.unc.edu
Maria Cristina Pattuelli
University of North Carolina at Chapel Hill
pattm@ils.unc.edu
Bijan Parsia
University of North Carolina at Chapel Hill
bparsia@email.unc.edu
W. Davenport Robertson
National Institute of Environmental Health Sciences
robert11@niehs.nih.gov

Abstract

This paper reports on a study that examined the ability of resource authors to create acceptable metadata in an organizational setting. The results indicate that authors can create good quality metadata when working with the Dublin Core, and that is in some cases they may be able to create metadata that is of better quality than what a metadata professional can produce. This research suggests that authors think metadata is valuable for resource discovery, that it should be created for web resources, and that they, as authors, should be involved in metadata production for their works. The study also indicates that a simple web form, with textual guidance and selective use of features (e.g., pop-up windows, drop-down menus, etc.) can assist authors in generating good quality metadata.

Keywords: Author-generated metadata, NIEHS, Dublin Core, metadata evaluation.

1. Introduction

Organizational web sites are growing at a rapid pace, particularly as employees and departmental offices increasingly turn to the web as a chief source for disseminating important information. Statistical and semantic-based search engines facilitate resource discovery on organizational web sites, often providing satisfactory results. As organizational web sites continue to grow, search engine scalability and retrieval effectiveness is likely to decline and organizations need to consider alternative or additional resource discovery options.

A metadata project is one way to improve resource discovery on an organizational web site. This can be accomplished by embedding structured metadata in web resource headers and installing a metadata search engine for searching on individual or a combination of metadata elements (e.g. HotMeta, developed by the Distributed Systems Technology Centre: http://www.dstc.edu.au/Research/Projects/hotmeta/search.html). Although this seems like a logical plan, organizations have been slow to explore this option due to uncertainties about *who should create metadata*. Professional metadata creators (e.g., catalogers and indexers) are ideal candidates (Milstead & Feldman, 1999), although they are costly and limited in their availability. Resource authors might also be tapped for metadata creation, yet there is a perception that author-generated metadata will be of poor quality and may actually hamper rather than aid resource discovery (Thomas & Griffin, 1999).

The research presented in this paper countered this notion and hypothesized that resource authors are good candidates for metadata creation in an organizational setting. Resource creators are intimate with their work, they want their work to be discovered and consulted, and they know their audience and can thus describe their resources appropriately. These factors support the hypothesis that resource authors can create acceptable metadata when working with the Dublin Core, a schema initially designed for resource authors. The use of the Dublin Core ties

in with this study's secondary hypothesis, which is that if given basic guidance through a simple and intelligible web form, resource authors can create professional quality metadata.

2. Metadata Generation for Web Resources

Web resource metadata can be generated via *automatic* or *human processes*. Within the context of the web, *search engine spiders*, *HTML* and *XML editors*, and *generators* produce various types of metadata via automatic means. These tools produce fairly accurate metadata for certain elements, such as "date produced" or "MIME type," but their results vary widely for more intellectually demanding metadata, such as "subject descriptors" or "author." As a result, many environments prefer human intellectual processing for the production of schema-specific metadata.

Professional metadata creators and resource authors represent two main classes of metadata creators.[1] *Metadata professionals*, such as catalogers and indexers, are persons who have had formal training and are proficient in the use of descriptive and content-value standards. Although researchers have noted problems with inter-indexer consistency (e.g., Chan, 1989), professionals generally produce high quality metadata (Weinheimer, 2000).

Resource authors (hereafter referred to as authors) are individuals responsible for the creation of the *intellectual content* of a work (Yee, 1995). Researchers regularly produce abstracts, keywords, and other type of metadata for their scientific and scholarly publications. Visual artists, another class of authors, generally sign and date their works. In the web environment, authors can provide metadata via a template or editor, while turning to web masters or other skilled persons to make their work web-accessible.

A number of digital library projects support author-generated metadata. This practice makes sense when weighing the Internet's rapid growth against the economics of hiring metadata professionals. Two examples include the National Digital Library of Theses and Dissertations (NDLTD) (http://www.ndltd.org) and the Synthesis Coalition's National Engineering Education Delivery System (NEEDS) digital library for engineering education (http://www.needs.org/engineering/). These projects both have web forms that help

authors to create consistent and accurate metadata for theses and dissertations contributed to the NDLTD and courseware contributed to NEEDS.

Author-generated metadata projects appear to be less popular in the organizational setting. The rationale given for this predicament is that authors lack the metadata professional's expert skills and they will produce insufficient and poor quality metadata (Weinheimer, 2000). Another possibility is the absence of an official program for providing sufficient metadata training to authors. Limited executive support and inadequate financial, human, and space resources are factors that may have an impact here. A final point to consider is that authors may be reluctant to participate in a metadata project because they view an executive recommendation for author-generated metadata as a *bureaucratic order* or *extra chore* as opposed to an option that has rewarding benefits. Organizations need to investigate these factors if they are to implement successful metadata projects, involve authors in metadata production, and improve resource discovery on their web sites. The research reported in this paper contributes to this process by presenting the results of a baseline study on the ability of authors to generate acceptable metadata in an organizational setting.

3. Metadata Metrics

Cataloging and indexing studies have counted the number of subject terms (subject headings or descriptors), name headings, and MARC fields per metadata record (e.g., Xu & Lancaster, 1998). Counting studies can provide valuable information and are fairly simple to conduct. Studies have also assessed metadata record quality by examining subject term specificity and exhaustivity, metadata record completeness, and other substantive factors (e.g., Zeng, 1993). Qualitative metadata examinations can be problematic because they have a subjective condition and because "to date, no consensus has been reached on conceptual and operational definitions of metadata quality" (Moen, 1997).

Although there is an absence of an established set of metadata metrics, researchers have identified a number of key characteristics that can be used for metadata evaluation. Moen et al.'s (1997) comparative analysis of bibliographic control, metadata, and digital library work by six different authors is one of the most thorough investigations in this area, resulting in 23 evaluation criteria. These researchers extracted *accuracy*, *consistency*, *completeness*, and *currency* from this initial set for an analysis of Government Information Locator Services (GILS) metadata records. Their four criteria overlap, to some degree, with Tozer's (1999) data

---

[1] Metadata creation is not limited to these two classes, as there are *technical metadata creators* and *subject enthusiasts* (*see* Greenberg, J. (2001, *in press*). Metadata and the World Wide Web. Encyclopedia of Library and Information Science. [40 manuscript pages.])

quality measures of *accuracy*, *completeness*, *consistency*, *timeliness*, and *intelligibility*. Rothenberg (1996) identifies *correctness* and *appropriateness* as two key aspects for data evaluation and emphasizes that the data's *contextual use* needs to be considered for improving data quality. Metrics, derived from the work cited here, facilitated this study's metadata evaluation.

4. Objectives of the Study

This preliminary study investigated the ability of authors to produce acceptable Dublin Core metadata for resources placed on the National Institute of Environmental Health Sciences' (NIEHS) web site. With this study, we aimed to develop procedures for gathering baseline data and to obtain some preliminary results about authors as metadata creators. The overriding goal of this experiment was to assist with the implementation of the NIEHS metadata project. The study was guided by the following three research questions:

♦ Can authors create acceptable Dublin Core quality metadata?
♦ What perceptions do authors have about metadata in general and metadata generation activities?
♦ What web form features can assist with author-generated metadata?

5. Methodology

A multi-method approach was used to examine this study's research questions. The primary methods included an experiment to collect the author-generated metadata and a content analysis to examine the acceptability of this metadata. A participant profile questionnaire and a post-metadata generation questionnaire gathered contextual information for data analysis.

NIEHS employees and scientists, identified as *authors*, were recruited for the metadata generation experiment. A set condition was that they had authored the intellectual content of at least one or more web resources; joint authorship was acceptable. A one-hour session was held in the NIEHS Computer Training Laboratory. During the first half-hour participants completed a profile questionnaire and partook in a metadata tutorial that introduced the concept of metadata and explained the features of the NIEHS-Dublin Core metadata form (hereafter referred to as the NIEHS form). [Figure 1, see Appendix]. The NIEHS form is loosely based on the DC-Dot Dublin Core metadata editor (http://www.ukoln.ac.uk/metadata/dcdot/) and presents the NIEHS-Dublin Core metadata

schema. The Dublin Core was selected for the NIEHS metadata project because it was developed for author-generated metadata and supports resource sharing and interoperability among information systems (*see* Robertson, et al., [*draft*, 2001] for NIEHS-Dublin Core Schema details and a discussion of how it relates to the Dublin Core).

During the second one-half hour of the experimental session, participants produced metadata records via the NIEHS form. The form requires authors to manually input metadata, except for *publisher* and *rights* metadata, which have fixed-values in the NIEHS-Dublin Core schema. As a result, these two elements are absent from the form's interface, but they are automatically generated when the author selects the submit button (the submit button is not shown in Figure 1 due to space limitations, it appears directly under the form). All metadata records input into the form and are stored in Extensible Markup Language (XML). After the metadata creation experiment, participants completed a post-metadata creation questionnaire.

The final step in this study was a content analysis conducted by two team members with professional cataloging experience in a joint session. Their goal was to determine the acceptability of the author-generated metadata. Metadata was *acceptable* if it was at the level that a professional cataloger would create or accept from another source, with or without modification, for inclusion in a resource header or database. The key factor was that acceptable metadata would support *resource discovery*.

6. Data Analysis

Data analysis for this study focused on two components: 1. metadata record content, and 2. authors' perceptions about metadata generation.

6.1 Content Analysis

The content analysis considered the participant profiles, the types of metadata produced, and the quality of the metadata.

6.1.1 *Participants and metadata creation*

Six participants, working in either NIEHS science or policy areas, with educational levels ranging form bachelor's to doctoral degrees, participated in the study. Four participants search the web daily, one weekly, and one on a monthly basis. All but one participant had heard the word "metadata" in reference to the web prior to the experiment, although it is not clear if this answer was influenced by the experiment's recruitment

process. Half of the participants had experience with HTML authoring.

The six participants produced a total of 11 metadata records during the experiment (Table 1). This averages to 1.8 (almost two) metadata records per-participant. Two participants produced one metadata record each, and one participant produced three metadata records. The mode was two metadata records per participant. A near mean of 15 minutes per metadata record can be approximated for this study based on the one-half hour allotted for the metadata creation task. A correlation between web skills and metadata production was not found.

The form ensured that all of the records produced contained metadata for the 12 mandatory elements. These include *publisher* and *rights* metadata, which have fixed values, and are automatically generated via the NIEHS form, and *title*, *audience*, *author/contributor*, *subject*, *date created*, *date modified, URL, language*, *type*, and *format*, which require author input. The creation of metadata for the optional elements varied per metadata record (*see* Table 1).

Table 1. Optional Metadata Creation

Metadata element	No. of records w/ this metadata
Alternative title	3
Description	1
Source	2
Other identifier	0
Coverage	2
NIEHS number	1
Relation	6

Table 1 summarizes the use of optional metadata elements by participants.[2] One participant created *description* metadata for only one of his two authored resources, although this metadata element could have been used by *all* of the participants for the *total sample* of 11 metadata records. Similarly, it's very possible that *alternative title*, *source*, *NIEHS number*, and *relation* metadata were part of the textual content or source code of the web resources being described, or known within NIEHS' organizational knowledge structure, and could have been easily created. The research reported on in this paper emphasizes the quality of the metadata that was *actually created*; however, future studies will consider the metadata that

---

[2] A technical problem resulted in a loss of some metadata for optional elements in 4 metadata records. Half of this data was recovered and is consistent with our conclusions.

could have been produced with a little extra effort on the part of the creator.

6.1.2 *Qualitative analysis*

Two members of the research team, who have had extensive experience as professional catalogers, evaluated the metadata quality and determined the overall acceptability of the metadata records. *Acceptance*, to reiterate, meant that the author-generated metadata was equivalent to what a professional cataloger would create or accept from another source, with or without modification, for inclusion in a resource header or database; and the guiding principle was that the metadata would support resource discovery.

An online survey consisting of two parts guided this examination (Figure 2, see Appendix). Part one of the survey supported an element-based analysis. Binary measures of "accept" or "reject" were assigned to the data content values created for each metadata element for all eleven metadata records. These results are summarized in Table 2. Column two presents the total number of metadata records that included metadata for each element, and column three gives the total number of metadata records that had acceptable metadata for each element and the percentage based on the figure given in column two.

Table 2. Results of the Qualitative Evaluation

Metadata Element	No. of records	% accepted
URL	11	11 (100%)
Author/contributor	11	11 (100%)
Title	11	9 (82%)
Alternative title	3	2 (67%)
Subject	11	8 (73%)
Date created	11	11 (100%)
Date modified	11	9 (82%)
Language	11	11 (100%)
Description	1	1 (100%)
Type	11	9 (82%)
Source	2	1 (50%)
Other identifier	0	0
Coverage	2	1(50%)
NIEHS number	1	0
Relation	6	6 (100%)
Format	11	10 (91%)
Audience	11	11 (100%)

Table 2 shows that the participants produced acceptable metadata for the majority of the NIEHS-DC metadata elements. The metadata elements *identifier (URL), author/contributor, date created, language, description, relation,* and *audience* were 100% acceptable. The rest of the

metadata elements (*title, alternative title, subject, date modified, type, source, coverage,* and *format*) had an acceptance rate ranging from 50% to 91%, with *source* and *coverage* being at the 50% level. None of the eleven records produced contained *other identifier* metadata.

Part two of the evaluation survey included a series of questions for assessing the intelligibility and the general correctness of the author-generated metadata. The evaluators found that all of the metadata records produced were intelligible and that the authors placed data content values in the correct metadata field. This part of the evaluation also directed two questions o the *subject* metadata element because it is one of the key reasons that human processing is often preferred to automatic processing and because there are many questions about the author's ability to provide adequate subject access without being trained in the principles of subject analysis. Here, the metadata professionals evaluated both the specificity and exhaustivity of the keywords entries. *Specificity* refers to the depth-level (e.g., granularity) of subject terms, and *exhaustivity* deals with breadth of topics represented by subject terms. Subject keywords for eight (73%) of the eleven records were assigned at the appropriate descriptive level and sufficiently covered the resources topics. Subject keywords in the other four records were found to be too general and did not sufficiently cover all of the topics represented in the resources being described. Only one participant produced unacceptable subject keywords for both of his authored metadata records. Participants creating unacceptable subject metadata in the other two records also demonstrated the ability to create acceptable subject keywords in their additional records showing no evidence of a negative pattern.

A final evaluation question used a four tier scale of "poor-reject," "fair—major revision," "good—minor revision," and "excellent—no revision" to measure the overall acceptability of the metadata records. All eleven of the metadata records were rated highly. In other words, the evaluators concluded that the author-generated metadata was acceptable for inclusion in a web resource header or a database and that it would facilitate resource discovery. Of the eleven metadata records 4 (36%) were *fair*, requiring major revision of selected metadata elements; 6 (55%) were *good*, requiring only minor revision; and one was *excellent* and of professional quality, thus requiring no revision. No correlation was found between participants' web skills and the quality of the metadata records produced.

6.2 Author perception about metadata creation

Data gathered via the post-metadata generation questionnaire provided insight into authors' general perceptions about metadata and suggestions on how the NIEHS web form might be improved to facilitate author-generated metadata.

A five-step semantic differential scale, on which 1 indicated "with difficulty" and 5 indicated "easily," gathered feedback on participants' perceptions about the task of metadata creation. All eleven participants indicated that creating metadata was fairly easy. This question resulted in a mean score of 4.7, with four participants scoring 5.0 and two participants scoring 4.0. A similar semantic differential scale was used to gather data on participants' thoughts about adding metadata to web resources, where 1 indicated "never" and 5.0 indicated "always." Overall, participants were positive about the value of adding metadata, with a mean of 4.0.

The participants were given a list of different categories of persons and asked to specify *who should create metadata.* The options included authors, web masters, departmental heads, secretaries/office assistants, librarians, and other, with room for suggestions. *Author* was most frequently selected, followed by *webmasters,* followed by *librarians,* and one person indicated that *department heads should* be involved in this task. Supporting the selection of author, one participant commented that, "*authors best know the* [web] *page and target audience.*" Two participants indicated that both author and librarian were preferred for this task because they best know the "*subject matter*" and "[audience/user] *searching patterns.*"

The post-metadata creation questionnaire included six questions to gather feedback on the usability of the NIEHS web form. Five participants indicated that the Web form was easy to use, while one participant indicated that it was standard. All of the participants agreed that using the web form required minimal learning time. With the exception of one participant who indicated that the help text was average (neither useless or overly helpful), all of the participants found the help text and terminology to be both helpful and understandable. Overall, these results show that the participants found the form usable. Several participants provided suggestions for improving the web form. Among these recommendations were the need for better guidance about the level of detail for the *subject* metadata, additional examples for the selected metadata fields, and more categories for the *type* metadata—a point related more to the NIEHS-Dublin Core metadata schema. One participant

summed up the form evaluation by commenting that *"the page is self explanatory and intuitive: however, for actual use a "philosophic" overview should be provided to major NIEHS users."*

7. Discussion of Results

This research shows that the authors participating in the experiment were able to create acceptable metadata according to the NIEHS-Dublin Core metadata schema and that their metadata generally requires only minor, if any, revision. The quality of the metadata produced clearly suggests authors in an organizational setting can create good quality metadata and that they have the ability to create professional level metadata. This research also identifies Dublin Core metadata elements that authors might have difficulty understanding, and it provides evidence about web form design that helps authors to generate acceptable metadata.

As part of the experiment, the NIEHS web form required authors to provide metadata for the 12 mandatory elements in order to produce (submit) their metadata records. As a result, mandatory and some optional metadata was collected for examination for eleven metadata records. This is a small sample, but certainly sufficient for evaluating the study's procedures and exploring the potential of an author-generated metadata project at NIEHS. Furthermore, the small sample size is useful in setting expectations for the next study that aims to collect records from approximately 60 participants. A secondary purpose of this study was to evaluate the basic usability of the web form. For that purpose, the sample size seems adequate as suggested by Nielsen and Landauer's (1993) cost-benefit model, which recommends between three and five test users. The fact that all eleven metadata records were evaluated as *acceptable*, and that the majority of records analyzed required only minor revisions indicates that authors are good candidates for generating metadata, and that they can indeed make a positive contribution to an organization's metadata project. Related to these results is the fact that a number of the participants conjectured that, as authors, they were good candidates for metadata creation. These participants expressed that they are obviously knowledgeable about their work, that they know their immediate and often potential audiences, and that they are aware of the way in which interested persons will search for their work. In other words, these participants saw their authorship role, together with their command of a discipline's language, as important metadata production factors.

Participant feedback as expressed here, combined with the actual results of the evaluation, suggest that authors may even be able to produce *better quality metadata* than professionals for selected elements. The evaluators verified the accuracy of the participants' metadata by examining the web page content and source code. In one case, *date created* metadata could not be confirmed and the evaluators asked the participant to clarify the origin of this information. The participant indicated that the date of creation was correct and based on his personal knowledge as the resource author. Date created for the *intellectual content* is frequently absent from web resources, and although authors may not recall the specific date a resource was created, they are likely to have a better idea of the month and year their intellectual activity compared to a cataloger, who did not produce the resource content. This example illustrates that *author knowledge is extremely valuable* for web resource metadata creation. Here, it should be emphasized that the date that a resource's intellectual content is created can—and often does—differ from the date it was made web accessible or revised on the web; this second interpretation of *date* metadata can be automatically generated via editing software.

The findings for *relation* metadata were similar to *date created* metadata results. In two records, the corresponding web page and source code did not provide any indication of related resources, although both metadata records gave URLs which, when examined, accurately supported the Dublin Core's use of relation. Over half of the metadata records contained relation metadata, which was the most frequently used optional metadata element. Without participant feedback, it was difficult to examine the use of the relation element in the other metadata records, although it is expected that, like *date created*, personal author knowledge was a contributing factor.

A comparison between *author* and *metadata professional's* abilities to create metadata requires a larger sample and a more extensive analysis than this preliminary study. Even so, the results of this study, combined with participant feedback, suggest that there are cases where authors may be able to provide better if not equal quality *subject* metadata as compared to what a metadata professional can produce. This conclusion is based on the fact that almost three-fourths (7 of 11, 73%) of the metadata records had acceptable subject keywords and displayed an appropriate level of subject specificity and exhaustivity. While further research is required for subject metadata, particularly given the high use of this metadata element for resource discovery (subject searching is among the most popular means of

searching on the Internet), it is likely that more guidance for authors could result in an even higher acceptance rate for this element.

While the results showed that authors are generally able to understand the Dublin Core, the low use and poor results found with all the optional metadata elements, excluding *relation*, suggests that there may be interpretation difficulties. This conclusion is loosely based on the limited use of these optional elements and the fact that one participant created unacceptable metadata for both *source* and *coverage*, yet overall an acceptable metadata record.

A final area to comment on in this discussion is the design of the NIEHS web form. The form includes selective use of pop-up windows, drop-down menus, and scrolling lists, each containing essential but limited data, to assist authors in generating metadata. A key objective in designing the NIEHS form was to keep it *simple*, exemplifying the spirit of the Dublin Core. Participant feedback from this study indicates that the NIEHS form is simple, intelligible, and overall a good product. While this inquiry was limited to a few post-metadata creation questions, the positive feedback gathered together with the acceptability rate for the author-generated metadata, indicate that intelligible textual guidance, selective use of features, keeping the form to one page (computer screen), and the use of a simple schema are important considerations for author-generated metadata. Given these results, it is not unreasonable to suggest that the NIEHS form may actually serve as a model for facilitating author-generated metadata in an organizational setting or even in other environments. A stronger argument may be presented here if the deficiencies noted, such as the need for more examples for selected elements and additional guidance on the level of subject detail required, were linked to the form in an unobtrusive way. These suggestions will be incorporated into the next release of the NIEHS form. In completing this discussion, it should be noted that during the data collection logs recorded participants' navigation of the NIEHS form. This data is still being analyzed, and will provide more insight into the use of web form features as well as other aspects of author-generated metadata.

8. Conclusion

This study investigated the ability of authors to create acceptable metadata in an organization, following the Dublin Core. In examining this question, data was also gathered about authors' perceptions on metadata and web form features that may facilitate author-generated metadata.

The results show that authors can create acceptable metadata according to the Dublin Core, specifically the NIEHS-Dublin Core schema, and that they can produce metadata that is equivalent to that of a metadata professional. These results prove that authors are indeed good candidates for metadata creation and that the Dublin Core is successful in supporting author-generated metadata. The results of this study established that they think metadata is valuable for resource discovery, that they think it should be created for web resources, and that they almost unanimously think they should be involved in the production of metadata for their works. Finally, the study shows that the design of a simple form, with selective use of features, may be the best means for author-generated metadata.

As with any baseline or exploratory study, conclusions drawn are limited by sample size and test conditions. The researchers note the limitations posed by the small sample size. However, the context of this examination needs be considered, in that is was primarily conducted to gather baseline data about the feasibility of implementing an author-generated metadata project at NIEHS. Given that this is a baseline study, generalizabilty is limited. Furthermore, conclusions drawn about metadata quality, while based on professional analysis, cannot be confirmed without testing the actual value of this metadata in a resource discovery experiment that measures user satisfaction.

At the time of writing this paper, the NIEHS metadata team is designing a follow-up study (with a much larger participant pool; aiming for a sample size of at least 60 records) in this area, incorporating results and refined procedures from this preliminary study. The next phase of this research will focus more on the *subject* metadata element and examine authors perceptions about participating in an organizational metadata project as well as when might be the ideal time for authors to generate metadata. A long-term evaluation is also planned to measure retrieval effectiveness and user satisfaction in relation to author-generated metadata.

Acknowledgements

References

[1] Chan, L. M. (1989). Inter-indexer consistency in subject cataloging. Information Technology & Libraries, 8(4): 349-358.

[2] Milstead, J. & Feldman, S. (1999). Metadata: Cataloging by any other name. Online, (January/February): 25-31. http://www.onlineinc.com/onlinemag/OL1999/milstead1.html.

[3] Moen, W. E., Stewart, E. L., & McClure C. R., (1997). The role of content analysis in evaluating metadata for the us government information locator service (GILS): results from an exploratory study. http://www.unt.edu/wmoen/publications/wmoen.htm.

[4] Nielsen, J. & Landauer., T. K.. (1993). A mathematical model on finding usability problems, Proceedings of the ACM INTERCHI '93 Conference (Amsterdam, the Netherlands, April 24-29), 206-213.

[5] Roberston, D., Leadem, E., Dude, J., & Greenberg, J. (in press, 2001), Design and Implementation of the National Institute of Environmental Health Sciences Dublin Core Metadata Schema. Proceedings for International Conference on Dublin Core and Metadata Applications 2001, October 22-26, 2001, National Institute of Informatics, Tokyo, Japan.

[6] Rothenberg, J. (1996). Metadata to Support Data Quality and Longevity. FIRST IEEE METADATA CONFERENCE. NOAA Complex. Silver Spring, Maryland. http://www.computer.org/conferences/meta96/rothenberg_Paper/ieee.data-quality.html.

[7] Thomas C. & Griffin, L. (1999) Who will create the Metadata for the Internet? First Monday: Peer Reviewed Journal of the Internet: 131.193.153.231/issues/issue3_12/Thomas/index.html.

[8] Tozer, G. (1999). Metadata Management for Information Control and Business Success. Boston: Artech House.

[9] Weinheimer, J. (2000). How to Keep the Practice of Librarianship Relevant in the Age of the Internet. Vine (Special issue on Metadata, part 1), 116: 14-27.

[10] Xu, H. & Lancaster, F. W. (1998). Redundancy and uniqueness of subject access points in online catalogs. Library Resources and Technical Services, 42 (1): 61-6.

[11] Yee, M.M. (1995). What is a work? Part 4: cataloging theorists and a definition abstract. Cataloging & Classification Quarterly, 20 (2): 3-24.

[12] Zeng, L. (1993). A study of a rule-based data validation system for online Chinese cataloging. Proceedings of the Fourteenth National Online Meeting 1993. Ed. Martha E. Williams, Learned Information, Inc. Medford, New Jersey, Learned Information, Inc., p.439-42.

[Figure 1 & 2 on next page.]

Figure 1: NIEHS-Dublin Core Metadata Form

Figure 2: Evaluation Survey

URL	http://www.niehs.nih.gov/odhsb/radhyg/hibeta.htm	⦿ accept ○ reject
TITLE	Safety Tips for Wording with High Energy Beta Radiation	⦿ accept ○ reject
ALTERNATIVE_TITLE	Safety procedures when using 32P or beta emmitters of energy 0.25 MEV	⦿ accept ○ reject
SUBJECT	Radiation High energy beta emmitters safety procedures beta radiation	⦿ accept ○ reject
AUTHOR-CONTRIBUTOR	Fitzgerald, Bill Hamrick, Philip	⦿ accept ○ reject
DATE_CREATED	1998-06-15	⦿ accept ○ reject
DATE_MODIFIED	1999-01-15	⦿ accept ○ reject
COVERAGE		empty
DESCRIPTION		empty
AUDIENCE	NIEHS Employees	⦿ accept ○ reject
NIEHS_NUMBER		empty
OTHER_IDENTIFIER		empty
SOURCE		empty
RELATION	http://www.niehs.nih.gov/odhsb/radhyg/lowbeta.htm http://www.niehs.nih.gov/odhsb/radhyg/125i.htm	⦿ accept ○ reject
TYPE	Text	⦿ accept ○ reject
LANGUAGE	English	⦿ accept ○ reject
FORMAT	text/html	⦿ accept ○ reject

1. In general, did the author put the metadata in the correct field? ⦿ Yes ○ No

2. In general, is the metadata record intelligible (understandable)? ⦿ Yes ○ No