Continuing Education in New Standards and Technologies for the Organization of Data and Information

A Report on the Cataloging and Metadata Professional Development Survey

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This study uses data from a large original survey (nearly one thousand initial respondents) to present how the cataloging and metadata community is approaching new and emerging data standards and technologies. The data analysis demonstrates strong professional-development interest in Semantic Web and Linked Data applications. With respect to continuing education topics, Linked Data technology, BIBFRAME, and an overview of current and emerging data standards and technologies ranked high. The survey data illustrate that personal continuing education interests often varied from reported institutional needs. These results reflect the fact that library services and projects in these emerging areas have not yet progressed beyond the exploratory stage. They also suggest that cataloging and metadata professionals expect to be able to exercise a mixture of core professional skill sets including teamwork, communication, and subject analysis, and the ability to adapt and accommodate Semantic Web standards and technologies, digital libraries, and other innovations in cataloging and metadata services.

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Seeking post-degree education opportunities is a professional fact of life for practicing librarians. The "shelf life" of the library science degree was believed to be about five years or less because of rapid advances in information technologies.[1] The collective need to broaden and update professional knowledge and skill sets may assume even greater importance for contemporary librarians and other information professionals to meet the evolving needs and preferences of their users in a rapidly changing digital environment. Supporting professional development for cultural-heritage and information professionals has been embraced as a national issue and priority by major funding agencies such as the Institute of Museum and Library Services (IMLS).[2]

Accelerating changes in information standards and technologies mean continuing education needs must be adequately addressed in the cataloging and metadata community. While most initial access to library resources may be through search engines, library systems must support successful retrieval and delivery to those resources, which include library catalogs, databases, and repositories. Quality metadata are thus important in supporting library services and systems.[3] Effective, efficient information organization requires a highly trained cataloging and metadata workforce who regularly keeps their knowledge and skills current through continuing professional development in their specific areas, including, but not limited to, BIBFRAME (a proposed replacement for the traditional MARC (Machine-Readable Cataloging) standards) and other Semantic Web technologies.[4]

Although continuing education is more essential than ever to providing quality cataloging and metadata services, the existing literature provides little specific information on its current or emerging needs or how best to support it. A significant problem is the absence of comprehensive data that could be used to guide improvements in continuing education for the cataloging and metadata community.[5] While recent efforts have been made to promote assessment and evaluation of continuing education needs in some parts of the library profession, such as science and technology librarianship, similar efforts are noticeably lacking within the cataloging and metadata community.[6] The problem extends well beyond this community of practice. For instance, participants in the 2013 CE Summit, hosted by the IMLS and OCLC, concluded that continuing education was in disarray for the library profession and emphasized the need to foster a well-integrated system of professional development based on a new, shared vision of library professionals' educational needs and effective methods and programs to meet those needs.[7]

The purpose of this exploratory study is to report findings from the online survey that was conducted as part of the authors' four-year IMLS grant-supported project (2014–18) on continuing cataloging and metadata education. The project's goal is to find effective mechanisms to facilitate access to professional development resources and opportunities relevant to practitioners' needs during times of rapid change. One of the project objectives is to develop a sustainable digital repository that aggregates learning materials and continuing-education opportunities for professional development in new information-organization standards and technologies. The repository is hosted and maintained by the College of Computing and Informatics at Drexel University. The survey was designed to better identify specific learning needs and gaps in knowledge, skills, or practices to be addressed in this repository. Specifically, the survey intended to explore practitioners' continuing education experience and interests, continuing-education needs relating to new standards and technologies for data and information organization, the current state of implementation, and any barriers that were encountered. This paper focuses on interests, issues, and perceptions relating to continuing professional education on new information-organization standards and technologies, such as Semantic Web technologies, plus professional competencies expected of cataloging and metadata librarians in rapidly changing information environments.[8]

Literature Review

The need for continuing education is commonly recognized as an increasing area of interest over the last decade as advances in professional practice and knowledge have led various professional groups to emphasize ongoing learning and development beyond initial preparation for a degree or certification.[9] Such general trends have been mirrored by developments within the library profession. Internationally, increasing concern about continuing professional development for library staff was epitomized by the report "Continuing Professional Development: Principles and Best Practices," published in 2006 by the International Federation of Library Associations (IFLA).[10] In the United States, the American Library Association (ALA) organized a series of national conferences on professional education several years earlier. Many of the action items they recommended were related to enhancing continuing professional development opportunities for library professionals and staff.[11] One result of these conferences was ALA's "Core Competencies of Librarianship," published in 2009. This policy document suggested that continuing education was one of the key professional expectations during one's career.[12] In the cataloging and metadata field, the Association for Library Collections and Technical Services (ALCTS), a division of ALA, similarly crafted *Core Competencies for Cataloging and Metadata Professional Librarians* in 2017. This document "defines a baseline of knowledge, skills, and behaviors" for those entering the profession, and emphasizes the importance of continuing education for professional and career enhancement.[13]

Despite the increasing importance of professional development, a search of the literature shows that insufficient research has been directed at examining continuing-education questions in the cataloging and metadata field. Past studies were limited mostly to the preprofessional curriculum and training provided to library school students and the competencies and skills expected for entry-level professional positions.[14] In professional settings, however, learning must occur throughout one's career, especially

as the world of information evolves at increasing rates and requires cataloging and metadata librarians to update their knowledge and skills continuously to adapt to changing concepts, practices, and contexts. As such, advancing one's understanding of the range of continuing-education issues is critical to making informed decisions to support the development of effective, broad efforts that meet the cataloging and metadata community's needs.[15]

The number of works published on continuing cataloging and metadata education has been limited, and these studies predate the current interest in opportunities offered by the Semantic Web and other new standards and technologies designed to increase the visibility of library resources on the open web.[16] Now that the bibliographic control environment is being reframed around an impending shift to Linked Data, led by BIBFRAME, there seems to be a pressing need to explore how cataloging and metadata librarians can continue to most effectively expand their knowledge and skill sets in this emerging area.

Research Questions and Method

The goal of the authors' current project, supported with a four-year IMLS grant, is to assess the changing continuing education needs and help formulate more effective and efficient ways to advance professional development in the cataloging and metadata community. With this paper, they intend to contribute to an increased understanding of the status of cataloging and metadata continuing education with regard to the following research questions:

- What are the perceptions of the cataloging and metadata community with respect to training topics in new standards and technologies for data and information organization?
- To what extent do practitioners' individual learning interests differ from or conflict with their institutional or organizational needs?
- What are the perceptions of the cataloging and metadata community regarding Semantic Web technologies that are driving large-scale integration of data on the open web?
- What professional competencies are considered important for cataloging and metadata librarians as new standards and technologies continue to disrupt the way we use information?

To collect data to investigate the research questions outlined above, the authors conducted a web survey using Qualtrics, a popular collection system for online survey data. The survey included mostly multiple-choice and Likert-scale questions, and some open-ended questions. Many multiple-choice questions asked respondents to check all applicable responses. The authors developed draft surveys that were sent to their IMLS project consultant for review and were revised before being disseminated for online data collection.

Table 1. Electronic Mailing Lists Used for the Survey

Mailing List	Email Address
Autocat listserv	autocat@listserv.syr.edu
DC-GENERAL listserv	dc-general@jiscmail.ac.uk
Electronic Resources in Libraries listserv	eril-l@listserv.binghamton.edu
Encoded Archival Description listserv	ead@loc.gov
Library and Information Technology Association listserv	lita-l@lists.ala.org
Metadatalibrarians listserv	metadatalibrarians@lists.monarchos.com
Next Generation Catalogs for Libraries listserv	ngc4lib@listserv.nd.edu
OCLC-Cataloging listserv	oclc-cat@oclc.org
Online Audiovisual Catalogers listserv	olac-l@oclc.org
PCCLIST listserv	pcclist@listserv.loc.gov
RDA-L listserv	rda-l@lists.ala.org
SERIALST listserv	serialist@listserv.nasig.org

Recruitment of survey participants was conducted by distributing invitation messages and subsequent follow-up reminders through twelve electronic mailing lists aimed primarily at cataloging and metadata professionals (see table 1). The authors selected these professional mailing lists for their large base of online subscribers. No incentives were offered to increase survey participation. To solicit survey responses from cataloging and metadata librarians who might not necessarily subscribe to these lists, the authors also contacted fifty state and regional technical services groups affiliated with ALCTS (see http://connect.ala.org/node/71131) and by requesting that their officers distribute the survey invitation message to their membership.

The survey was open from December 9, 2014, to February 15, 2015. During this approximately two-month period, the authors received 1,237 initial survey responses; 646 respondents (52 percent) completed the entire survey. Considering the length and complexity of the survey (which contained nearly thirty questions), the survey completion rate was higher than normally expected.[17] The relatively low drop-off rate may have been an indication of the importance with which the cataloging and metadata community regards professional-training issues with respect to new standards and technologies for data and information organization.

Table 2. Respondents' Professional Positions (*N* = 638)

Position	Percentage
Library Administrator	5.6
Cataloging Department Head, Manager, etc.	28.5
Metadata Department Head, Manager, etc.	7.4
Cataloging Librarian	41.7
Metadata Librarian	17.1
Paraprofessional (cataloging)	8.2
Paraprofessional (metadata)	2.8
Library student worker (cataloging)	0.5
Library student worker (metadata)	0.5
Other	15.2

Note: Numbers in the table exceed 100 percent because the respondents were asked to check all applicable answers.

Respondents' Profile

Table 2 presents data on the professional positions that were self-reported by survey participants. Most responses were from professional librarians and managers working in the cataloging and metadata field. While many respondents (15.2 percent) selected the "Other" category, a closer look at their additional free-text answers indicated that most of them held professional positions related to cataloging or metadata services, such as head of technical services, cataloging or metadata archivist, digital services librarian, and repository librarian.

Figure 1 presents an overview of the survey participants' years of professional experience. Nearly 60 percent of respondents reported at least ten years of professional experience in the cataloging and metadata profession. Nearly one out of six respondents reported fewer than three years of experience. The general professional profile identified in the survey led the authors to conclude that the respondents collectively provided a substantive, useful sample of observations and opinions related to the authors' research questions reflecting the perspectives of a broad cross-section of the cataloging and metadata community.

Figure 2 illustrates the distribution of survey participants by the types of libraries in which they were employed. Nearly 60 percent reported that they worked in academic libraries and 14 percent worked in public libraries. Approximately 8 percent of respondents (including some who provided additional free-text information) worked in special libraries, while 6 percent worked in archives and special collections. The "Other" responders also showed a small proportion of responses (3.4 percent) from those working at national and state libraries. Since academic librarians constitute a distinct minority (about 17 percent) of all librarians in the United States,[18] the survey data indicate that far more

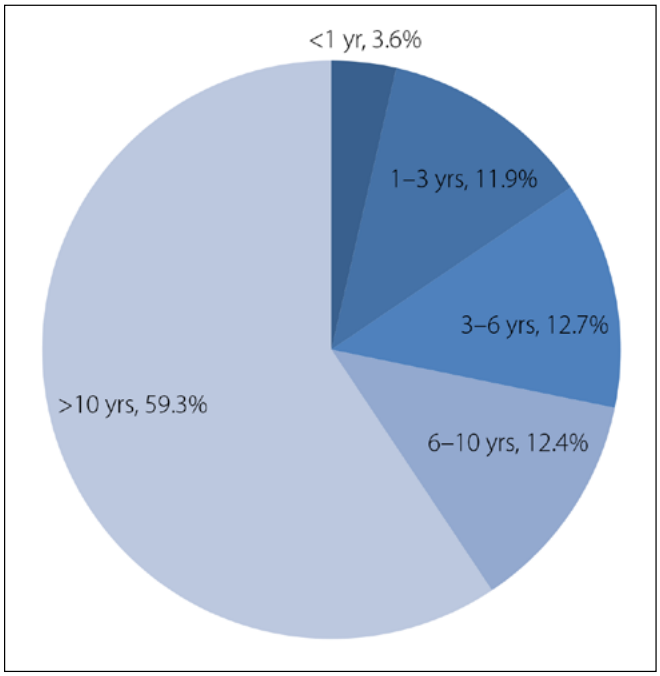

Figure 1. Respondents' Years of Experience (*N* = 637). Numbers in this and following tables may not add up to 100 percent because of rounding.

responses were received from their rank as compared with their relative percentage to the profession. In light of similar recent surveys targeted at the cataloging and metadata community, however, the predominance of respondents working in academic institutions had been anticipated because the authors had relied on self-selected volunteers who decided to share opinions and observations on the substantive questions the authors were researching.[19] Because academic libraries often lead the library community in adopting new developments and innovations in information services and technology, it is not surprising that their librarians were more interested in keeping abreast of current developments and emerging trends in the cataloging and metadata field. Additionally, the academic library workforce may have been more inclined to participate because professional development tends to be less supported in nonacademic libraries, particularly public libraries.[20]

Results

Perceived Continuing Education Needs in New Standards and Technologies for Data and Information Organization

The respondents were asked what continuing education topics personally interested them. Table 3 shows that topics relating to newer information standards and technologies,

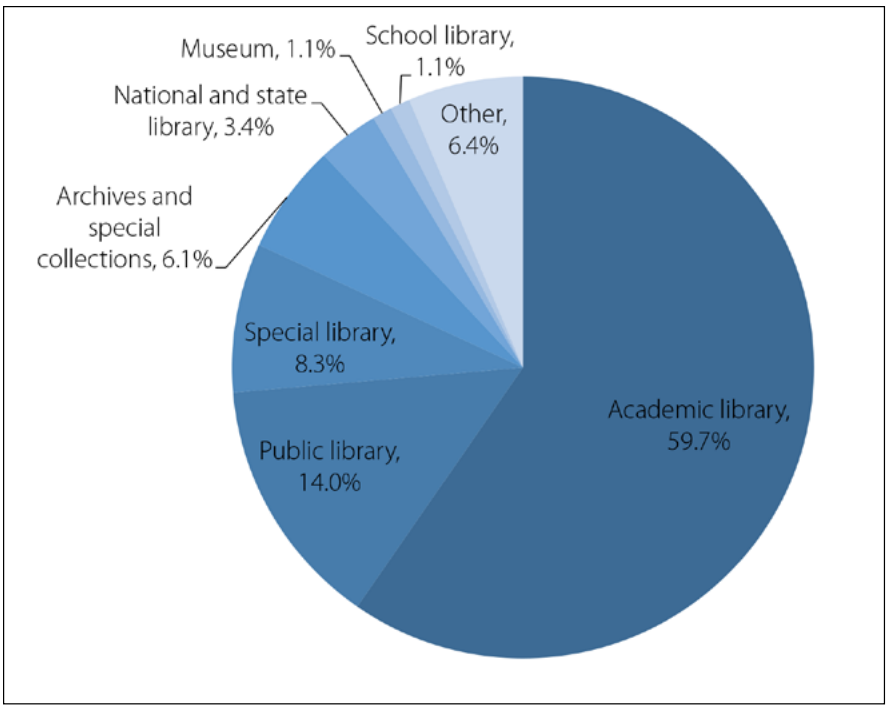

Figure 2. Respondents' Institutional Affiliations (*N* = 642)

such as "overview of current/emerging data standards and technologies," "linked data applications," and "BIBFRAME," were among the top rated. These responses seemed to demonstrate personal commitment to professional excellence and dedication to staying professionally relevant and current with emerging changes in the field as the cataloging and metadata community prepares to transition to new library data models on the open web. "RDF" (a standard data model for the Semantic Web) and "Semantic Web applications in libraries" were also rated highly, demonstrating a strong current of professional interest in their potential for producing innovative approaches to a variety of information-organization contexts in digital libraries and repositories.

Notably, table 3 shows that RDA (Resource Description and Access) was another continuing education topic that received a top rating from respondents. RDA attracted the survey's largest number of "very interested" responses, suggesting that transitioning from AACR2 (Anglo-American Cataloguing Rules, 2nd edition) remained a major professional-development interest at the time of the survey, nearly two years after US RDA implementation by the Library of Congress (LC)—especially as many expert cataloging communities are still developing RDA best practices guides for their special formats. This point was elaborated in additional comments by many respondents who specifically mentioned cataloging of special formats as a critical area needed for continuing education.

In addition to a more traditional topic like RDA, the survey results also showed that many metadata issues—"metadata standards," "metadata project management," "semi-automatic metadata generation and tools," "markup languages (e.g., XML)," and "interoperability issues"—were rated as relatively important areas for professional development. Related topics such as "digital libraries," "digital repositories," and "preservation of born-digital resources and digitized resources" received similarly high ratings. Furthermore, reflecting the current environment for academic libraries, another noticeable result was the importance of "data management" as a continuing education topic for cataloging and metadata librarians.[21] This result seemed to indicate a recognition of the increasing need to work toward leveraging professional expertise and learning best practices to maximize public access to massive amounts of digital data sets, often in response to government and funding agencies' open data policies.[22]

In contrast, the survey identified many continuing education topics that respondents ranked much lower. Only about one-third were either "very interested" or "interested" in "folksonomies and social tagging in library catalogs," suggesting that adding user-generated social features to OPACs was not a priority for a large majority of cataloging and metadata librarians. More specialized topics such as "SKOS (Simple Knowledge Organization System)," "taxonomy," "thesaurus construction," and "ontologies" also did not receive high ratings. The results seemed to indicate that the demand for these specific topics, while not entirely insignificant, was limited to subgroups within the cataloging and metadata community. The same analysis may be also consistent with the relatively low rating for "programming languages (e.g., Python, Java)," which may be included as part of general professional responsibilities only for a small proportion of cataloging and metadata librarians.

The authors asked survey participants to rate the importance of continuing education topics as reflected by their institutions' organizational needs and projects and their professional roles and responsibilities. This follow-up question was added to explore whether any notable differences exist between their personal learning interests and their institutional or organizational needs. The question produced interesting results, as shown in table 4. Most potential topics were institutionally rated substantially

Table 3. Personal Interest in Continuing Education Topics (*N* = 704–34)

	Response (%)				
Topic	Very interested	Interested	Neutral	Not interested	Not sure
Overview of current/emerging data standards and technologies	37.5	44.5	14.7	3.5	0.3
RDA (Resource Description and Access)	46.5	33.6	14.8	6.1	0.4
Linked data applications	39.8	36.7	16.7	3.7	3.6
BIBFRAME	42.9	30.8	12.3	7.6	6.4
Metadata standards (e.g., EAD, MODS)	38.0	36.7	18.8	5.9	2.1
Metadata project management (planning, implementation, and quality control)	29.3	41.1	19.6	7.5	2.4
RDF (Resource Description Framework)	31.0	38.9	18.8	5.8	6.1
Semantic Web applications in libraries (e.g., projects, techniques)	31.3	37.6	20.7	7.2	3.6
Data management	25.2	40.2	23.7	6.6	3.5
Semiautomatic metadata generation and tools	25.3	40.0	22.1	9.3	3.2
Digital repositories	25.3	38.9	25.7	8.2	1.7
Digital libraries	22.0	41.6	25.4	8.0	1.8
Markup languages (e.g., XML)	27.9	35.8	25.3	9.8	1.7
Interoperability issues	20.5	35.1	28.6	8.2	5.9
Preservation of born-digital resources and digitized resources	24.6	31.5	27.2	14.0	2.5
Ontologies	17.4	26.6	30.7	11.9	10.8
Thesaurus construction	14.7	27.9	33.2	18.1	5.3
Taxonomy	13.1	29.0	33.9	14.4	8.6
Programming languages (e.g., Python, Java)	17.2	24.9	28.1	26.1	3.3
SKOS (Simple Knowledge Organization System)	13.8	27.7	32.2	10.9	14.4
Folksonomies and social tagging in library catalogs	9.8	25.3	33.7	26.0	3.2

less important (10–20 percent lower when measured by "very interested" and "interested" responses combined) compared with their personal interest levels. While cataloging and metadata librarians were personally interested in enhancing their knowledge and gaining skills in new standards and technologies, their institutions and organizations displayed less interest. This may stem from the fact that many of their libraries lacked relevant ongoing or future projects, or that new skills and knowledge were not yet required in their current professional positions.

The survey revealed several continuing education topics whose institutional or organizational needs generally matched their personal interest levels (i.e., rated only slightly lower or sometimes even a little higher). Such topics included "RDA," "overview of current/emerging data standards and technologies," "digital repositories," "data management," "metadata project management," and "digital libraries." It seems reasonable to assume that these areas were largely where many libraries currently had ongoing activities, projects, and plans that required their cataloging and metadata staff to consider active participation in relevant professional-development activities. High ratings for "overview of current/emerging data standards and technologies" seemed to provide good evidence for this observation because libraries can successfully transition to a linked data environment only when their cataloging and metadata staff possess broader professional knowledge.

Current Perceptions of Semantic Web Technologies in the Cataloging and Metadata Community

The move toward the Semantic Web has the potential to provide a foundation for open data exchange and new services that are driven by robust bibliographic description and resource discovery, and sharing in the broader networked world. LC's initiative to transition libraries from MARC formats to BIBFRAME is part of such efforts to build a

Table 4. Continuing Education Topics and Institutional/Professional Needs (*N* = 691–712)

Topic	Personal Interest "Very Interested/Interested" (%)	Institutional Interest "Very Interested/Interested" (%)	Difference (%)
Overview of current/emerging data standards and technologies	75.4	69.1	-6.3
RDA (Resource Description and Access)	78.8	78.6	-0.2
Linked data applications	61.3	46.6	-14.7
BIBFRAME	59.8	45.9	-13.9
Metadata standards (e.g., EAD, MODS)	58.9	44.2	-14.7
Metadata project management (planning, implementation, and quality control)	66.1	61.7	-4.4
RDF (Resource Description Framework)	55.3	41.1	-14.2
Semantic Web applications in libraries (e.g., projects, techniques)	52.4	36.2	-16.2
Data management	66.1	66.2	0.1
Semiautomatic metadata generation and tools	53.1	40.8	-12.3
Digital repositories	69.5	74.7	5.2
Digital libraries	62.2	60.1	-2.1
Markup languages (e.g., XML)	46.9	30.4	-16.5
Interoperability issues	55.1	53.7	-1.4
Preservation of born-digital resources and digitized resources	59.4	62.6	3.2
Ontologies	24.5	3.8	-20.7
Thesaurus construction	26.9	10.8	-16.1
Taxonomy	25.1	7.6	-17.5
Programming languages (e.g., Python, Java)	26.6	11.0	-15.6
SKOS (Simple Knowledge Organization System)	23.5	5.1	-18.4
Folksonomies and social tagging in library catalogs	23.8	11.8	-12.0

web-scale, Linked Data infrastructure for unlocking the power of library metadata and making it much more visible to the communities they serve. Another key question that the authors intended to explore is how the cataloging and metadata community currently perceived the implications of Semantic Web technologies. The results revealed a strong consensus that their implementation would represent a new opportunity for the profession, with 51.8 percent that "strongly agree" and 36.7 percent that "agree."

Table 5 provides survey data on the potential benefits of Semantic Web technologies as selected by the respondents. Their responses expressed high expectations about the promises of the Semantic Web to improve user services and support improved data and resource discovery services. Most respondents seemed to agree that machine-actionable data enabling intelligent transactions would contribute significantly to "increasing the value of library data and their presence on the web." Most survey participants indicated that Linked Data models would "reduc[e] redundancy and improve[e] efficiency" in cataloging and metadata work while producing a web-based, highly hyperlinked data set for "richly linked metadata description." Furthermore, approximately two-thirds of the respondents agreed that the "very important" or "important" benefits of the Semantic Web include "linking multiple domain-specific knowledge bases to support interdisciplinary research and creation of new knowledge" and "increasing the value of library data and their presence on the web."

The survey also revealed that respondents tended to be less optimistic regarding the other potential benefits of Semantic Web technologies. Handling information resources expressed in multiple languages is not uncommon in cataloging and metadata workflows. Linked Data has the potential to allow library data created in one country to be linked and reconciled for use in an international context. However, reflecting the fact that multilingualism has only begun to receive attention in the Semantic Web community, far fewer respondents listed "supporting multilingual functionality for data and user services" among the the Semantic Web's important benefits.[23] Additionally,

Table 5. Potential Benefits of the Semantic Web (*N* = 633–69)

	Perceived Importance (%)				
Potential Benefit	Very Important	Important	Neutral	Not Important	Not Sure
Improved user services	62.9	29.1	3.0	0.6	4.3
Improved data/resource discovery	55.4	34.6	3.7	1.0	5.2
Increasing the value of library data and their presence on the web	47.1	37.1	8.2	1.8	5.8
Enhanced discovery services through federated or web-scale searches	48.1	35.9	6.5	1.7	7.9
Reducing redundancy and improving efficiency of bibliographic descriptions	42.1	34.4	13.1	4.1	6.2
Having a richly linked metadata description	36.3	39.9	13.0	2.3	8.6
Providing authority data for names and subjects with unique identifiers so that they can be shared on the web	37.5	31.1	17.5	5.9	7.9
Linking multiple domain-specific knowledge bases to support interdisciplinary research and creation of new knowledge	30.4	34.0	19.1	4.0	12.6
Supporting multilingual functionality for data and user services	21.6	24.4	28.0	13.6	12.5
Reusing and/or combining data contributed by nonlibrary communities	19.4	25.0	26.7	14.5	14.4

respondents notably had only moderate expectations about "reusing and/or combining data contributed by nonlibrary communities"—a contrast from high expectations about the promise of integrating library data into the wider web. This result seemed to indicate that there was much less interest within the cataloging and metadata community in using Semantic Web technologies for integrating nonlibrary data into the library environment.

Professional Competencies for Cataloging and Metadata Librarians in the Twenty-First Century

Recent studies have shown that technological advances demand new knowledge and competencies for cataloging and metadata librarians.[24] To investigate what professional expertise would be needed for this community, the authors asked respondents about professional competencies that they believed would be important for the future of cataloging and metadata librarians. As shown in table 6, some of the top competencies identified in the survey responses were "ability to learn and use software," "knowledge of metadata standards and quality control," "ability to collaborate with people within the organization and beyond," "oral and written communication skills," and "ability to use controlled/uncontrolled vocabularies for subject indexing and resource discovery." More than 90 percent of respondents rated these categories as "very important" or "important." The survey data indicated that core traditional professional competencies, like the ability to work as a team and communication skills, would remain as vital as the ability to effectively react to new software and technologies and advances in cataloging and metadata standards. The skill sets listed above were followed in perceived importance by "ability to use Semantic Web standards and technologies," "ability to supervise and manage staff," "digital library project management," and "ability to use markup languages," which were rated "very important" or "important" by 73–83 percent. In contrast, competencies such as "project evaluation," "ability to write successful grant proposals," "programming skills," and "foreign language skills" received much lower ratings, although they were still considered to be "very important" or "important" by a majority of respondents.

In light of the increasing importance of newer data standards and Semantic Web technologies, the authors were also interested in asking participants about the roles that they expected cataloging and metadata professionals to play in their development and implementation. The respondents were almost equally divided between those who expected their own profession to collaborate with other stakeholders in developing newer standards and technologies (56.6 percent) and those who foresaw others, including those outside the library world, as the primary leaders in such efforts (58.7 percent). Nearly half of the respondents (46.3 percent) perceived that the community's role was in testing and providing feedback to improve newer standards and technologies. Concerning their implementation, about

Table 6. Competencies for Cataloging/Metadata Professionals in the Twenty-First Century (*N* = 665–72)

	Perceived Importance (%)				
Competency	Very Important	Important	Neutral	Not Important	Not Sure
Ability to learn and use software	67.9	27.7	3.4	0.3	0.7
Ability to collaborate with people within the organization and beyond	64.2	30.9	3.7	0.3	0.9
Knowledge of metadata standards and quality control	64.6	30.4	4.0	0.1	0.7
Oral and written communication skills	64.0	30.7	4.2	0.7	0.3
Ability to use controlled/uncontrolled vocabularies for subject indexing and resource discovery	58.4	35.4	4.9	0.1	1.2
Ability to use Semantic Web standards and technologies (e.g., Linked Data application, ontologies)	44.0	38.9	9.9	0.9	6.3
Ability to supervise and manage staff	36.5	45.9	13.8	2.6	1.2
Digital library project management	34.6	44.9	14.7	1.3	4.5
Ability to use mark-up languages (e.g., XML)	34.2	38.9	18.2	2.2	6.4
Management, such as SWOT analysis (strengths, weaknesses, opportunities, threats), evaluation of projects, development of new initiatives	21.3	39.8	25.7	5.4	7.8
Ability to write successful grant proposals	20.9	38.7	27.9	5.4	7.2
Programming skills	19.3	36.4	29.3	8.1	6.9
Foreign-language skills	19.0	36.3	36.0	4.5	4.2

one-third of the respondents (36.0 percent) expected cataloging and metadata librarians to play secondary roles as consultants for nonlibrary professionals who would be the primary drivers implementing current and emerging standards and technologies. One-fifth of the respondents (20.9 percent) felt that the community would have few roles to play in either development or implementation.

On a related note, the authors further aimed to explore how cataloging and metadata librarians perceived the future of their profession as rapid advances in technology have affected significant changes in their workplaces. To evaluate this question, the authors reviewed how respondents reacted to semiautomatic metadata generation and its perceived effects on cataloging and metadata work. Though not yet used widely in digital libraries and repositories, automatic metadata generation provides a potential technical innovation that could improve efficiency and reduce cost in organizing the vast amount of digital data.[25] The survey data revealed somewhat mixed attitudes. Nearly half of the respondents expected that automated metadata workflows would increase the efficiency of cataloging and resource management (11.1 percent "strongly agree"; 37.4 percent "agree"). However, the survey notably also revealed strong concern and reservation about machine-generated metadata. Nearly 20 percent of respondents observed that semiautomatic metadata-generation tools would negatively affect the future of cataloging and metadata services. One notable objection was the lack of confidence in machine-generated metadata creation itself. Some respondents expressed concern that such metadata would be inaccurate or unusable because of poor quality. Another key concern was the potentially adverse consequences of automatic metadata generation on the professional status of cataloging and metadata librarians, with some believing that it would devalue the "importance of the work done by professionals" and promote the deprofessionalization of cataloging and metadata work.

Conclusion

The purpose of the current paper was to report and analyze key findings of original survey data from more than one thousand initial respondents on the continuing education needs of the cataloging and metadata community regarding new information standards and technologies. The survey was conducted as part of the authors' four-year IMLS-funded project to better meet the needs of cataloging and metadata professionals to improve their professional knowledge, skills, and abilities through relevant professional-development programs and resources. This paper focused on the prevailing perceptions of Semantic Web technologies

that provide new opportunities for the development of library services. The authors also explored self-identified continuing education topics and professional competencies that cataloging and metadata librarians believe to be essential for the future of their profession in the rapidly evolving information environment.

Regarding professional development topics, Linked Data applications, BIBFRAME, and an overview of current and emerging data standards and technologies were ranked high by survey participants. RDA was also rated highly as a continuing education interest. The survey data indicated that personal continuing education interests often varied from their reported institutional or organizational needs. There was strong professional development interest in Semantic Web and Linked Data applications, even if respondents' institutions lacked ongoing or planned projects in this area. Such newer topics were considered as lower priorities for professional development in many libraries. These results reflect the fact that library services and projects in those newer areas have not yet progressed beyond the exploratory stage within the cataloging and metadata community.[26]

While newer data standards and Semantic Web technologies have not yet begun to change established processes in most libraries, the survey results presented overwhelmingly positive expectations about their anticipated effects on the development of cataloging and metadata services and the publication of library data on the web. The survey data also showed a lack of interest in integrating nonlibrary data sources to enhance library metadata and services. The authors intended to examine how these developments may be changing the profession's views on the importance and adequacy of professional competencies. The responses suggested that cataloging and metadata librarians understandably believed that, to be effective during their careers, their core professional skill sets should be combined with knowledge of emerging information standards and technologies. Supplementing their baseline competencies like teamwork, communication, and subject analysis by continuing professional education is essential to develop the ability to adapt and accommodate Semantic Web standards and technologies, digital libraries, and other innovations in cataloging and metadata services.[27] Regarding such newer information standards and technologies, opinion was divided on whether the cataloging and metadata community will play a major role in their development and implementation. While many respondents perceived that technological innovations would make their work more efficient, the survey also revealed strong concerns about their negative consequences on their professional status.

As noted earlier, the survey was conducted as part of the authors' IMLS-funded project to explore more effective, sustainable ways to support continuing education activities. One of the objectives of the authors' IMLS grant is to develop a digital repository that serves as a portal to continuing-education resources in new information-organization standards and technologies. In this area, the current survey found an overwhelming interest in having such a central portal (62 percent "very interested"; 32 percent "interested"). Nearly 80 percent of the respondents expressed interest in free, self-paced online-learning resources available for download via the repository; a similar percentage expressed interest in learning from a sequence of modules designed to build knowledge and competency on topics in emerging standards and technologies.

The intended focus of this paper was to illustrate via the survey results how the cataloging and metadata community is approaching new data standards and Linked Data technologies. The authors' post-survey plan is to use the data reported in this paper to inform the development of the digital repository, focusing on newer standards and technologies for data and information organization that are starting to radically reshape established services and processes in libraries and cultural-heritage institutions. The study results will help identify key topics to focus on the areas of new standards and technologies.

The survey findings could be explored in future studies on continuing education and professional competencies needed in the emerging information environment. While the authors' survey allowed them to efficiently collect data, the data reflected the responses from a self-selected group of respondents who might have held strong preexisting opinions. To overcome these potential limitations, applying other approaches for validating the findings reported in this paper, such as in-person interviews, would be useful. Additionally, it would be interesting to provide a more granular analysis by focusing on subgroups working across different types of libraries; this may enable the authors to identify their potential differences in terms of continuing education.

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