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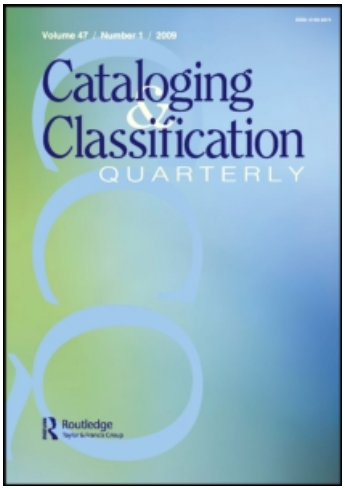

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Metadata Professionals: Roles and Competencies as Reflected in Job Announcements, 2003–2006

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This study presents the current state of the roles and competencies sought from metadata professionals. We conducted a comprehensive content analysis of 107 job descriptions posted on the AUTOCAT listserv from January 2003 through December 2006. Multivariate techniques of cluster and multidimensional scaling analysis were applied to the content analysis. Results show that the principal responsibility expected of metadata professionals concerns metadata creation (73.8%). In addition to metadata creation, electronic resource management, awareness of trends, and digital library development constitute the core areas of demand in the metadata profession. The findings of the study also show that knowledge and skills centering on traditional cataloging and classification standards (60.7%) remain highly relevant in the digital environment and accordingly to metadata professionals.

KEYWORDS Metadata professionals, job description analysis, metadata, electronic resources, competencies, digital libraries

INTRODUCTION

The rapid proliferation of digital library-related projects has engendered a shift in the role of information professionals involved with organizing and managing information resources. In light of rapid changes in the profession,

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several studies report emerging job titles, responsibilities, and skills in relation to managing electronic and digital resources. However, there is still a lack of studies focusing on metadata professionals in terms of the roles and competencies brought about by the emergence of the digital environment. There is also a need to examine the relationship between the competencies and skill sets sought from metadata professionals and traditional cataloging standards and practices.

The goal of this study is to investigate the current state of responsibilities and competencies expected of metadata professionals who deal primarily with digital and electronic resources. For this, we conducted a comprehensive content analysis of 107 job descriptions posted between January 2003 and December 2006 on the AUTOCAT listserv. We limited our selection to announcements containing job titles with one of the following terms: *metadata, electronic, e-resources*, and *digital*.

The goal of this study is directly derived from the following research questions:

1. What are the key roles that metadata professionals play in the digital environment?
2. What are the key competencies and skill sets demanded of metadata professionals?

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LITERATURE REVIEW

Aggregated analysis of job announcements provides a view of the preferences and expectations employers have for new hires.[1] However, there is a lack of studies concerning the roles and competencies expected of metadata professionals. In this section, studies directly and indirectly related to the job responsibilities and skill sets expected of metadata professionals are presented.

Through a survey, Buttlar and Garcha investigated the changing roles of cataloging professionals in the current and future library environments.[2] They surveyed 500 catalogers in academic libraries to determine whether and how cataloging job functions had changed from 1987 to 1997. Based on 271 responses, they identified a series of changes that occurred in the responsibilities of professional catalogers. These changes included: increased responsibility in cataloging special formats and materials such as audiovisual formats and electronic resources, Web site design, and increased management tasks. Additionally, catalogers had become more involved in activities formerly in the domain of systems librarians. These activities included selecting and implementing cataloging products, developing specifications for microcomputer applications, database maintenance, records management and indexing, OPAC and network maintenance, and system selection and evaluation.

In 2003 Leysen and Boydston surveyed the heads of cataloging and technical service departments in 100 Association of Research Libraries (ARL)–member academic libraries.[3] The study reports that the primary responsibility of catalogers has shifted from cataloging to the management of cataloging activities, including system integration and vendor product implementation. New skills are needed to adapt to technological advances and the electronic environment; metadata creation in particular is anticipated to be critical to catalogers in the future.

Looking from a broader perspective at some of the major changes in technical services departments in the past 15 to 20 years, Glasser reports on the developing roles and responsibilities of the cataloging profession from the late 1980s onward.[4] She points out the main factors powering change: technological advances, automation, the growth of electronic resources, increased user demands on library services, and shrinking budgets. Glasser also points out that "the greatest change in staff roles has been the trend of delegating tasks . . . while responsibilities that had been solely within the realm of management are allocated to professional catalog librarians."[5] Further, cataloging professionals are expected not only to master standards and tools for traditional cataloging, but also be equipped with a variety of skills and knowledge encompassing management, computers, oral and written communication, teaching, and metadata standards.

Identifying 1995 as the date that the Internet first made a significant impact on cataloging jobs, Chaudry and Komathi divided 131 job descriptions sampled from *American Libraries* into two periods: 1990–1994 (traditional environment) and 1995–1999 (electronic environment), and compared the expectations of employers for job candidates in the two periods.[6] They reviewed the job descriptions in terms of eight categories: knowledge of cataloging tools and resources, knowledge of automated cataloging systems, knowledge of Internet/digital systems, computing skills, communication skills, managerial skills, relevant work experience, and educational requirements. The results of the study show that traditional cataloging knowledge and tools are still relevant in the electronic environment even as job responsibilities have been expanding into the electronic environment.

Khurshid examined the changes in job requirements and qualifications of catalogers stemming from the development of Internet technologies and library automation.[7] She analyzed job descriptions published in *American Libraries* and *College & Research Libraries News* from 2000 to 2001 in terms of position titles, degree requirements, and required qualifications and skills. The study identified a series of emerging titles such as electronic/digital resources librarian, metadata librarian, and metadata analyst. New skills directly related to electronic resource management were also identified.

To determine the effect of emerging electronic resources and digital assets on Library and Information Science (LIS) education, Hall-Ellis analyzed 266 entry-level cataloger position announcements published in *American*

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Libraries or posted on AUTOCAT between September 2000 and August 2005.[8] The announcements were analyzed by looking at the expectations of employers for entry-level cataloging professionals in terms of academic preparation and technical skills and competencies. Findings indicate that employers expect that entry-level catalogers will have taken one or more cataloging courses. Familiarity with several metadata schemes such as Dublin Core (DC) and Encoded Archival Description are also expected from entry-level catalogers. Hall-Ellis recommends, based on the results of the study, expansion of cataloging courses, and the number of faculty who teach cataloging courses. She also recommends regular offerings of metadata course(s) in LIS curricula.

To examine the skills needed for serials librarians in an electronic environment, Kwasik conducted a study based on 90 job descriptions posted in *SERIALST*, *American Libraries, College & Research Libraries News*, and *The Chronicle of Higher Education* between 1999 and 2001.[9] She found that knowledge of cataloging and classification standards is the most frequently named required qualification. Experiences with bibliographic utilities and integrated library systems are also noted as requisite skills for serials librarian positions. In terms of desired skills, knowledge of the DC metadata scheme, markup language, and Web design are frequently named. The study also identified new job titles for serials librarians such as electronic resources cataloger, digital resources librarian, and electronic serials librarian. The study indicates that "cataloging print and electronic resources, markup language, Dublin Core, and management are going to be the areas in which serials librarians will need further training."[10]

Davis and Arthur recorded the discussion led by Ginanni at the 2005 North American Serials Interest Group meeting on the demand for electronic resource librarians.[11] Except for a few attributes such as serials knowledge, most of the identified attributes for the electronic resources positions concern personal and behavioral characteristics such as flexibility, creativity, cooperative/collaborative approach, big-picture thinker, ability to multi-task, excellent communication skills, and the ability to follow through. The recorded discussion reports some difficulties related to fitting electronic resource librarians into a library's organizational structure.

The ambiguity of placing electronic resource librarians in an organizational structure is also noted in the study by Albitz, who collected position descriptions drawn from *College & Research Libraries News* from January 1996 through December 2001 to examine the management of electronic resources in academic libraries.[12] The position descriptions are analyzed in the areas of reporting structures, responsibilities, and professional experience requirements. Content analysis shows that positions dealing with electronic resources are associated with both technical and public services in terms of the reporting structures.

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In relation to Albitz's study centering on electronic resource librarians in public services, Fisher reviewed 298 job announcements from *American Libraries* between January 1985 and December 2001 in order to trace the development of the electronic resources librarian position.[13] Cataloging and metadata positions related to electronic resources are not included in this study. By analyzing the responsibilities and qualifications, the study identified the ten most cited characteristics. They grouped these into three major categories: traditional public service functions (reference, instruction, and collection development), technology-related functions (computer applications, online searching, and Web applications), and personal factors (communication skills, experience, management, interpersonal skills).

From a broader perspective, a study by Sreenivasulu discusses the need to create the job title "digital librarian" and identified a series of responsibilities for digital librarians.[14] These include management of digital libraries, organization of digital knowledge and information, cataloging and classification of digital documents and knowledge, dissemination of digital information, provision of digital reference services and electronic information services, provision of knowledge mining, handling the tasks of massive digitization, digital storage processes, and digital preservation. The study also points out competencies and skills related to the managing of a digital library. Those categories are Internet and WWW, multimedia, digital technology, digital media processing, digital information system, online and optical information, and the ability to think in terms of knowledge networks.

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METHODOLOGY

To gather the data, we reviewed the AUTOCAT listserv from January 2003 to December 2006 and we selected job descriptions based on titles that included the term "metadata," "electronic," "digital," and "e-resources." For a four-year period (January 2003–December 2006), 107 distinct job descriptions were collected.

As Table 1 shows, the number of positions doubled from 2003 (n = 15) to 2004 (n = 31). Even though there was a decrease in 2005 (n = 21), in 2006 the number (n = 40) of job announcement almost doubled from 2005. This indicates an overall increase of job announcements, reflective of an increased need for metadata professionals during the survey periods (2003–2006).

TABLE 1 Yearly Count of Job Announcements for Metadata Profession

Year	2003	2004	2005	2006	Total
Number of job announcements	15	31	21	40	107

To gain a broad content structure of job descriptions, we first conducted a pilot study. For this, we manually coded a small number of job descriptions, identifying the most frequently occurring content structure of job descriptions. Those are job titles, background information of the institution, job responsibilities, qualifications and skills, and basic information on the application process such as contact address and deadline. For this pilot study, we examine only job titles, job responsibilities, and required qualifications/skills.[15]

Following this preliminary step, we employed the content analysis software package, SimStat/Wordstat[16] and input all job descriptions into the software. The frequency of terms and phrases is derived from the input data for the content areas of job titles, job responsibilities, and required qualifications and skills. Categorization dictionaries were built for the areas of job responsibilities and required qualifications and skills. The categorization dictionaries were created on the following basis: (1) frequency of terms and phrases in job descriptions; (2) categories identified from relevant studies; (3) categories identified from the pilot study; and the (4) researchers' own domain knowledge.

In order to ascertain the overall structure and relationships of these categories in the area of required qualifications and skill sets, term co-occurrence matrices were computed. These matrices are based on the number of job descriptions in which a pair of categories co-occurs. The frequency counts of categories were converted to a matrix of co-occurrence similarity (correlation) values. The similarity values indicate the relative similarity or dissimilarity of occurrence for pairs of terms.

Two multivariate techniques of cluster analysis and multidimensional scaling (MDS) were used to identify clusters of categories with similar co-occurrence patterns and to generate a map representing the underlying dimensions of these categories. The cluster analysis looks at the similarities or distances between categories when forming the clusters. We utilized hierarchical agglomerative methods (a bottom-up building) that incorporate the co-occurrence matrix as similarity measures among the categories. The hierarchical agglomerative clustering process can be illustrated in a graphic display such as a dendrogram. It shows the successive grouping of individuals and clusters from an initial state, in which all are separate, to a final state, in which a single cluster remains.

In other words, during hierarchical cluster analysis each category is initially treated as a cluster. The two categories with the least/shortest distance (or greatest similarity) are first combined into a cluster. The process of adding categories to existing clusters, creating new clusters, or combining clusters is iterative.

The MDS technique is utilized to capture and visualize similarities and dissimilarities of data in two or three dimensions. Each dimension can be labeled based on the configuration of these categories on the map. In order

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to visualize the pattern of proximities among the categories, a MDS map is constructed. This map shows the array of different categories in two-dimensional spaces. The physical distance between categories is visually representative of similarities and/or dissimilarities among them. Categories with the greatest co-occurrence appear grouped in the map; thus, the MDS map graphically shows how categories do or do not cluster. The MDS method is particularly effective for this study inasmuch as it allows us to visualize and capture the relationships of categories of skill sets.

FINDINGS AND DISCUSSION

In the following sub-sections, we will present the findings of this study in the following three areas: (1) Job titles; (2) Responsibilities; and (3) Required qualifications and skills.

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Job Titles

The analysis of job titles delineates a picture of the role of metadata professionals. The data analysis evinces a great variety of job titles. A total of 54 different job titles were identified out of a total of 107 job announcements. Table 2 lists the 16 job titles that appear more than once in our data set.

The job titles **Metadata Librarian** and **Catalog/Cataloging** appear most frequently (12%). It is noteworthy that approximately half the job titles (53%) contain terms such as *catalog*, *cataloger*, and *cataloging* as shown in Table 2. Examples include **Catalog & Metadata Librarian, Cataloging & Metadata Management Librarian,** and **Metadata Cataloger**. The trend

TABLE 2 Job Titles of Metadata Professionals

	Job title	Count
1	Metadata Librarian	13
2	Catalog/Cataloging & Metadata Librarian	13
3	Serials & E-Resources Cataloger	8
4	Head, Cataloging & Metadata Services	7
5	Electronic Resources Librarian	5
6	Digital Projects Metadata Librarian	3
7	Electronic Resources Cataloger	3
8	Serials & E-Resources Librarian	3
9	Digital Resources Librarian	3
10	Cataloging & Metadata Management Librarian	2
11	Electronic Access Librarian	2
12	Metadata Cataloger	2
13	Metadata Specialist	2
14	Music Catalog/Metadata Librarian	2
15	Electronic Resources Coordinator	2

line beyond the survey time period (2003–2006) in regard to the prominence of these mixed titles used in job announcements is an area to look at for assessment of changes in the field.

The job title **Serials & E-Resources Cataloger** (7%) also occurs with a relatively high frequency. The tendency has been for electronic periodicals such as journals and magazines to be gradually substituted for their print counterparts as the primary format of serials resources. This may account for the relatively high frequency of the job title Serials & E-Resources Cataloger. As electronic serials have become a major information source, the job title of Serials & E-Resources Cataloger is indicative of the need for metadata professionals prepared for the increasingly important environment of electronic serials.

Responsibilities

A categorization dictionary was built for areas of responsibilities; the most frequently occurring terms and phrases describing responsibilities were used for building the dictionary. Table 3 displays the category labels along with examples of terms appearing in the position announcements that are assigned to the category. The percentage of announcements in which the terms appeared in the data set is also provided. The sample terms and phrases in the second column are illustrative and not meant to be exhaustive.

The principal responsibility expected from metadata professionals concerns **Metadata Creation** (73.8%). The most frequently stated responsibility of Metadata Creation concerns ability and experience in using a variety of major types of metadata schemes such as Dublin Core, Encoded Archival Description (EAD), Metadata Object Description Schema (MODS), Text Encoding Initiative (TEI), and the Visual Resource Association (VRA) Core.

The critical role played by metadata quality assurance for resource discovery, particularly in the stage of metadata creation, is noted by several studies. For instance, Park's studies present cases of incomplete, inaccurate, and inconsistent metadata creation through an examination of metadata item records drawn from Dublin Core–based digital repositories.[17] Currier et al. also point out problems inherent in the metadata creation process, such as inaccurate data entry (e.g., spelling, abbreviations, format of date [date of creation or date of publication] and inconsistency of subject vocabularies).[18]

In addition to Metadata Creation, **Electronic Resources Management** (64.5%), **Awareness of Trends** (55.1%), and **Digital Library Development** (48.6%) constitute the core areas of demand in the metadata profession. Accordingly, these four areas serve to characterize the key roles that metadata professionals play in the digital environment.

As shown, **General Cataloging** (65.4%) also constitutes a primary category of responsibility expected from metadata professionals. This comprises activities such as copy and original cataloging, authority control, and

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TABLE 3 Categories of Responsibilities

Category label	Example terms and phrases	Number of cases	% Cases
METADATA CREATION	Metadata Services, Metadata Schemes, Dublin Core, EAD, MODS, TEI, METS, VRA Core	79	73.8
MANAGEMENT	Administer, Coordinate, Lead, Head, Monitor, Guide, Oversee, Supervise, Policymaking, Strategic, Planning, Hire	73	68.2
CATALOGING	AACR, MARC, DDC, LCC, LCSH, LCRI, Copy Cataloging, Descriptive Cataloging, Original Cataloging, Subject Analysis, NACO, SACO, Authority Control	70	65.4
E-RESOURCES MANAGEMENT	Electronic Formats, Electronic Journals, Online Resources, Digital Resources, Digital Objects	69	64.5
AWARNESS OF TRENDS	Current Trends, Emerging, Evolving, Up-to-date, Maintain Currency	59	55.1
DIGITAL LIBRARY DEVELOPMENT	Digital Initiatives, Digital Projects, Digitization Projects	52	48.6
PROBLEM SOLVING	Question answering, Problem solving, Troubleshoot, Feedback, Resource Person	47	43.9
BIBLIOGRAPHIC CONTROL and BIBLIOGRAPHIC UTILITIES	Bibliographic Control, Bibliographic Access, Bibliographic Records, OCLC, RLIN	46	43.0
STAFF TRAINING	Train Staff	34	31.8
PROFESSIONAL DEVELOPMENT	Conferences, Professional Organizations, Professional Development, Research and Publication, Scholarly Communication	32	29.9
SERIAL MANAGEMENT	Serial Publications, Serial Cataloging	26	24.3
PUBLIC SERVICES	Customers, Patrons, Users	25	23.4
DEPARTMENT LIAISION	Liaison	23	21.5
WEB DEVELOPMENT	FTP, Network, WWW, HTML	21	19.6
STATISTICS REPORT	Statistical Reports	21	19.6
REFERENCE	Reference Desk, Research Assistance	18	16.8
DATABASE MANAGEMENT	Database Administration, Database Maintenance	18	16.8
COMMITTEE PARTICIPATION	Serves on Committees, Library Committees, University Committees, Task Forces	18	16.8
INTEGRATED LIBRARY SYSTEM (ILS)	Automated Library System, Integrated Library System, Horizon, Innovative Interfaces, INNOPAC	17	15.9
COLLECTION DEVELOPMENT	Acquisition, Collection Management	13	12.1
COMMITMENT TO FLEXIBILITY	Changing Environment, Dynamic Environment	13	12.1
INSTRUCTION	Bibliographic Instruction, Teach	12	11.2

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descriptive and subject cataloging. Ability in utilization of cataloging standards and tools such as AACR, MARC, LCC, and LCSH is also included in this category. **Bibliographic Control and Utilities** (43%) also evidences a relatively high degree of the responsibilities expected of metadata professionals. This category includes responsibilities in handling bibliographic utilities such as OCLC for bibliographic access.

Management activities (68.2%) appear to be an area in high demand from metadata professionals. Management comprises activities such as administration, coordination, overseeing, supervision, policymaking, and strategic planning. In relation to the area of managerial responsibility, **Problem-Solving** activities (43.9%) such as troubleshooting, question-answering, acting as a resource person, and **Staff Training** (31.8%) evidence a relatively high demand.

In addition to the aforementioned responsibilities, there are a wide variety of responsibilities expected from metadata professionals. These include **Database Management, Professional Development, Public Services, Department Liaison, Web Development, Reference, Committee Participation, Collection Development, Commitment to Flexibility,** and **Instruction**.

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Required Qualifications and Skills

The analysis of required competencies and skills is primarily based on the terms and phrases frequently used in the description of the required qualifications in job announcements. Table 4 displays the category labels along with examples of terms that are assigned to the category as well as the percentage of announcements in which the terms appeared in the data set. The sample terms and phrases in the second column are illustrative and not meant to be exhaustive.

The most frequently stated required skill concerns **Interpersonal Communication** (78.5%), which includes both collaboration and communication skills. **Cataloging and Classification Standards** (60.7%) such as AACR2, DDC, LCC, LCSH, LCRI, and MARC also appear to be high demand. This indicates that knowledge and skills on traditional cataloging and classification standards remain highly relevant in the digital environment and accordingly to metadata professionals.

Knowledge and skills related to **Metadata Standards** (57%) evidence high frequency. It is also interesting to note that awareness of current and emerging **Trends** (44.9%) occurs with high frequency. This indicates that it is critical for metadata professionals to be able to adapt to a changing environment and keep abreast of emerging technologies.

Skills related to **Electronic/Digital Resources Management** (43%) stand out as important requirements for metadata professionals. Effective

TABLE 4 Categories of Required Qualifications and Skills

Category label	Example terms and phrases	Number of cases	% Cases
INTERPERSONAL SKILLS S	Collaborate, Cooperate, Interact, Collegial, Team, Communication, Oral and Written	84	78.5
CATALOGING STANDARDS	AACR, MARC, DDC, LCC, LCSH, LCRI, MeSH, CONSER, NLM, NACO, SACO	65	60.7
METADATA STANDARDS	Dublin Core, EAD, METS, MODS, OAI, TEI, VRA Core	61	57.0
TRENDS	Current Trends, Emerging Trends, Evolving	48	44.9
ELECTRONIC/DIGITAL RESOURCES MANAGEMENT	Digital Collections, Online Resources, Digital Projects	46	43.0
MANAGEMENT	Coordinate, Leadership, Head, Guide, Supervise	45	42.1
BIBLIOGRAPHIC CONTROL and UTILITIES	Bibliographic Control, OCLC, RLIN, CONNEXION	40	37.4
COMPUTER SKILLS	Hardware, Software, Office Applications, Word Processing, Spreadsheet, Windows	38	35.5
INDEPENDENCE	Independent, Self-Motivated, Self-Directed	38	35.5
PROBLEM SOLVING	Analytic Skills, Troubleshoot, Decision making	37	34.6
INTEGRATED LIBRARY SYSTEM (ILS)	Automated Library System, Integrated Library System, Innovative Interfaces, INNOPAC, Horizon	26	24.3
PUBLIC SERVICES	Clients, Customer Service, Patrons, User, Service-Oriented	24	22.4
PROFESSIONAL COMMITMENT	Professional Development, Professional Growth, Professionally Active, Research Skills, Scholarship	23	21.5
FLEXIBILITY	Changing Environment, Dynamic Environment	22	20.6
WEB KNOWLEDGE	FTP, Network, WWW, HTML, SGML	21	19.6
FOREIGN LANGUAGES	Asian Languages, Western European Languages, Spanish, German, French	15	14.0
STAFF TRAINING	Teach, Train	11	10.3
CREATIVITY	Innovation, Inventive	8	7.5

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management of electronic/digital resources is fundamental for efficient provision of information access. The categories of **Computer Skills** (35.5%) and **Web Knowledge** (19.6%) are also skills that are highly relevant to the digital environment and are critical areas reflecting the impact of technology on the metadata professionals.

It is noteworthy that **Managerial Skills** (42.1%) is a highly sought after competency from metadata professionals. **Problem Solving** (34.6%), concerning activities such as troubleshooting and decision making, and **Staff**

Training (10.3%) are categories related to supervisory or managerial aspects of a position.

Independence (35.5%) shows a relatively high demand. This indicates that metadata professionals are expected to not only be able to work collegially with others but also be able to take initiative. **Public Services** (22.4%), an area involving interaction with end-users, also shows a relatively high demand. Other identified categories include: **Flexibility**, **Creativity**, **Professional Commitment**, and **Foreign Languages**.

In order to identify the overall structure underlying the above categories, the co-occurrence matrices are created based on the number of job descriptions in which a pair of categories co-occurs. Cluster analysis and multidimensional scaling are then applied to the co-occurrence matrices. The phi coefficient is an index of the association between two sets of binary variables. In this case, each category is viewed as a binary variable based on its occurrence in a job description. The cluster-forming process of required skill categories is visualized in the dendrogram (Figure 1).

During hierarchical cluster analysis, the two categories with the least/shortest distance (or greatest similarity) are combined into a cluster. As shown in Figure 1, **Bibliographic Utilities** and **Cataloging Standards** display the lowest distance and these two categories are joined first; ILS joins next to this cluster. This cluster relates to the traditional core technical aspects of cataloging. **Metadata** and **Trends** are joined as an independent cluster as well.

The largest cluster contains six categories including **Creativity, Professional Commitment**, **Flexibility**, **Problem Solving**, **Independence**, **and Interpersonal Skills**. Most of these categories are related to personal and behavioral characteristics. The second largest cluster is formed by five categories: **Metadata Standards**, **Electronic Resources**, **Trends, Computer**

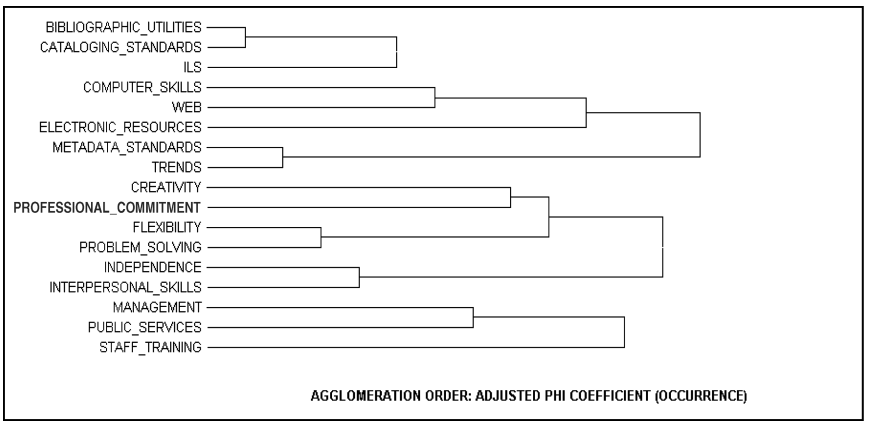

FIGURE 1 Dendrogram of required qualifications and skills.

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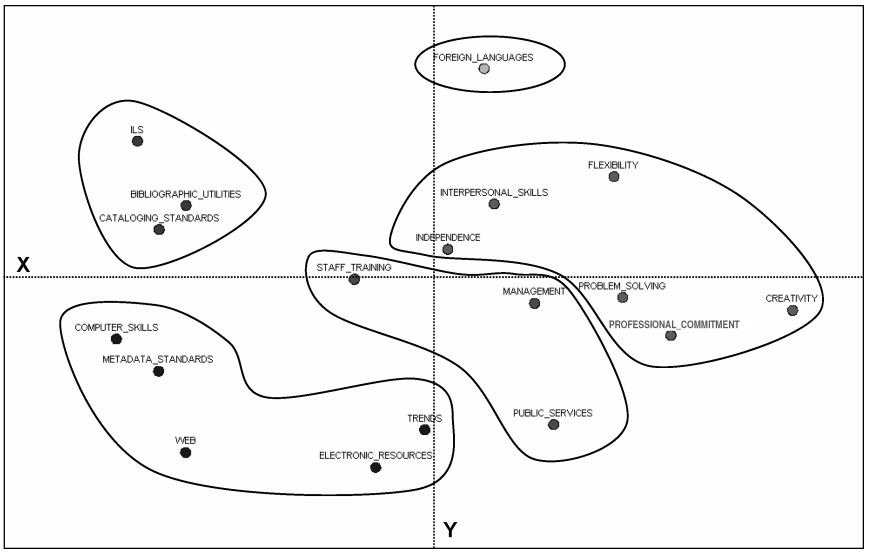

FIGURE 2 MDS map of required qualifications and skills.

Skills, **and Web knowledge**. These categories represent the core characteristics of the metadata profession in relation to competencies and skill sets geared toward the digital environment. In addition to the aforementioned clusters, the categories of **Management** and **Public Services** and **Staff Training** form an independent cluster. There is also an outlier, **Foreign Languages**, which is not joined with any other category.

The pattern of proximities and relations among these categories is illustrated in the MDS map in Figure 2. Note that the optimal number of dimensions is three ($R^2 = 0.87$, Stress = 0.21), but due to the difficulty in presenting 3D-MDS on paper, the first two dimensions are displayed here. The largest cluster, drawn mostly from the category of personal and behavioral characteristics such as **Creativity, Flexibility,** and **Interpersonal Skills**, is located at the right side of the map. The second largest cluster appears at the lower left part of the map. It comprises the technical aspects of metadata creation and management drawn from the categories **Computer Skills**, **Metadata Standards**, **Web**, **Trends**, and **Electronic Resources**. It is interesting to note that the categories encompassing the core technical aspects of traditional cataloging (e.g., **Bibliographic Utilities** and **Cataloging Standards**) is adjacent to the aforementioned cluster characterizing the metadata professionals. This indicates that knowledge and skills related to the core technical aspects of cataloging remain highly relevant in the digital environment and are being integrated into electronic resource management, metadata creation, and computer and Web applications.

The dimensions represented by the X- and Y-axes can be identified based on the array of the clusters. The MDS map graphically displays the

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underlying dimensions of the categories of required qualifications and skills. Along the horizontal X-axis, the cluster located on the left side of the map reflect the categories of the digital environment such as Computer Skills, Metadata Standards, Web, Trends, and Electronic Resources as well as the categories characterizing the core technical aspects of traditional cataloging such as Bibliographic Utilities and Cataloging Standards; the clusters at the right end of the map mostly concern personal and behavioral characteristics such as Flexibility, Professional Commitment, and Creativity. Thus, a technical dimension seems to underlie the structure of the clusters along the X-axis: from the core technical aspects on the left side to the general behavioral skills on the right side.

Along the vertical axis (Y), the categories located at the lower part of the map reflect emerging technical aspects of metadata professionals, while the categories located at the upper part of the map tend to be associated with behavioral and non-technical aspects of the metadata profession. In this sense, the technical versus non-technical dimension seems to underlie the structure of the clusters along the Y-axis.

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CONCLUSION

In summary, year-by-year totals of job announcements for metadata professionals show that there is an overall increase in the number of job announcements during the survey period (2003–2006). The principal responsibility expected of metadata professionals concerns metadata creation (73.8%). Metadata professionals with ability and experience using a variety of major types of metadata schemes such as Dublin Core, EAD, MODS, TEI, and VRA Core are in high demand. In addition to metadata creation, electronic resources management (64.5%), awareness of trends (55.1%), and digital library development (48.6%) comprise the core responsibility expectations of metadata professionals.

General cataloging (65.4%), covering activities such as descriptive and subject cataloging and authority control, also appears as a primary responsibility expected of metadata professionals. This indicates that traditional cataloging tasks and practices are still highly relevant and are being integrated with the activities of metadata creation and electronic resource management that characterize the key roles that metadata professionals play in the digital environment.

The multivariate techniques of cluster and multidimensional scaling (MDS) analysis of the categories of required qualifications show that knowledge and skills related to metadata creation, electronic resource management, and computer and Web application are in critical demand. It is interesting to note that awareness of current and emerging trends (44.9%) also evidences a high demand. This indicates that it is critical for metadata

professionals to be able to adapt to a changing environment and keep abreast of emerging technologies and metadata standards.

It is noteworthy that competencies and skills concerning cataloging and classification standards such as AACR, MARC, LCC, LCSH, and name and subject authority control are particularly in demand. Cataloging and classification standards (60.7%), in fact, appear with a higher ranking than metadata standards (57%) in the categories of required qualifications and skills (see Table 4). This indicates that cataloging and classification standards remain highly relevant in the digital environment. Accordingly, competencies and skills related to established cataloging standards and practices such as bibliographic utilities, cataloging standards, and ILS form one of the major clusters in the MDS map (see Figure 2).

The findings of this study provide an insight on LIS education: results indicate that electronic resource management, metadata creation, and digital library development need to be reflected in LIS curricula. There is a vital necessity to provide students with the knowledge and complex skills vis-à-vis metadata standards and electronic and digital resources requisite in the digital environment.

Regarding limitations of the present study, we collected job announcements for metadata professionals only from the AUTOCAT listserv. Even though AUTOCAT is a major channel for job announcements for the metadata profession, there are other sources of job announcements for professionals in the field. Thus, there is substantial ground for future studies; further examination with more data sources will enable us to have a better understanding of the current state of the roles and competencies faced by metadata professionals. Future research also lies in further examination of the high demand for managerial skills. Managerial roles and responsibilities, especially focused on entry level positions, are also grounds for further study.

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