Knowledge Organization for Digital Library Education: A Discipline in Flux

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Abstract

This paper presents the preliminary results of a study investigating the current state of knowledge organization education in American schools of library and information science. The goal of the study is to assess the status of entry-level knowledge organization education in U.S. library and information schools from three perspectives: course content, students’ perception, and workplace requirements. The results may serve as a framework for discussion about the role knowledge organization education should play in digital librarianship. Moreover, the findings will help to inform the design of knowledge organization courses so they better meet the needs of the digital library workplace.

Keywords

Knowledge Organization curriculum, Digital Library Education, Library and Information Science Education, Curriculum design

1.0 Introduction

In their sociocultural analysis of the discipline of knowledge organization, Anderson & Skouvig (2006) assert that knowledge organization activity “is a de facto human activity” (p. 300). Undeniably, knowledge organization lies at the very heart of library and information science. As Library and Information Science (LIS) rapidly evolves and the digital perspective becomes more and more pervasive, the role and scope of the knowledge organization curriculum must also evolve to “weave libraries into the web” (Covert 2001, p. 41). This paper presents the results of an exploratory study investigating the current state of knowledge organization education in American schools of library and information science. The goal of this study is to analyze the existing course framework and begin a dialogue about the requirements and design of entry-level knowledge organization courses in the context of digital library education.

1.1 What Are We Talking About When We Talk about Knowledge Organization?
It is important to define exactly what we're talking about when we talk about knowledge organization in LIS education. Knowledge Organization courses are typically required courses for ALA-accredited LIS programs in North America and are identified by an array of different labels that range from "Organizing Information" to "Information Processing in Library and Information Science". The differences that characterize knowledge organization courses are not just a matter of semantics. The courses also differ in content approach and topic coverage. For many schools, the course is still intended as an introductory library cataloging class and topics in support of developments in digital librarianship are addressed marginally or not at all.

As LIS education begins to address the dynamic nature of networked electronic environments that require new roles for and competencies of information professionals, knowledge organization education must too adapt. Traditional cataloging faces critical challenges as for affordability and scalability, and relevance of established principles and practices are questioned. The methods and skills for organizing information and scholarly output are increasing exponentially in the context of digital librarianship. Studies such as this one are needed both to understand what knowledge organization means in today's LIS education and to further the conversation about the challenges the profession faces and the competencies required to meet them.

2.0 Literature Review

While discussing “Approaches to knowledge organization,” Hjørland (2007) addresses the “digital challenge” that knowledge organization faces in networked systems and digital media. As Hsieh-Yee (2004) points out, the exponential growth of digital information disseminated in a variety of formats has deeply altered the way we organize and represent information and knowledge. The escalating volume of publications in multiple formats and the continuous advancement of information retrieval and dissemination systems have challenged the traditional model of bibliographic cataloging. The Library of Congress Working Group on the Future of Bibliographic Control (2008) stress how much the environment in which cataloging operates is changing. In essence, we are “at a critical juncture in the evolution of bibliographic control and information access/provision” (p. 1).

Today, traditional cataloging departments are at a critical juncture, with numerous catalogers expected to retire in the next decade and likely to be replaced by other types of librarians fulfilling different roles. However, as Danskin (2007) points out, this does not translate into a devaluation of the function of resource description and representation. In fact, these tasks appear to be even more relevant to networked systems and digital environments. The literature has recently offered important insights into the “changing nature of the catalog” (Calhoun, 2006) and the future of cataloging (Byrd, 2006; Marcum, 2006). Technological development is viewed as the major factor in changing users’ information-seeking behavior and discovery expectations. As a consequence, the bibliographic control landscape needs to change in order to survive. However, change is not a simple process, as the transition in the U.S. content standards (e.g., the replacement of AACR2 with RDA) illustrates.

The impact of these concerns has been felt even in knowledge organization's more theoretical realms, where such researchers as Smiraglia (2006) and Dahlberg (2006) have reviewed the current state of the art and assessed future research directions for the discipline. There are already heated discussions between those with contrasting
views of how the role cataloging should be addressed in LIS education. Cataloging instruction and learning has been under scrutiny for years. A significant body of literature has been devoted to discussing the status of cataloging education with a focus on curriculum requirements for cataloging in master’s level programs and core competencies and skills needed for cataloger’s careers (McAllister-Harper, 1993; Hill, 1997; Vellucci, 1997; Spillane, 1999), including international cataloging education (Sun & Carter, 2006).

Research on the state of knowledge organization education has been conducted by Hseih-Yee (2004) in response to the Library of Congress (LC) Action Plan focused on metadata education for new LIS professionals. Following a survey, the study’s findings revealed that cataloging courses have declined in number as required courses, while LIS programs are increasingly relying on introductory courses to provide cataloging and metadata education. The reduction in the number of traditional cataloging courses has determined the diffusion of a “more integrated course model with cataloging as only one component” (Letarte, Turvey, Borneman & Adams, 2002, p. 12). Knowledge organization courses may be the only place where students are exposed to the wide array and different levels and types of cataloging. As a consequence, introductory knowledge organization courses are increasingly relied upon to fulfill a variety of foundational LIS educational requirements, sometimes becoming the cornerstone for different library professionals’ roles.

Core cataloging competencies for entry-level academic librarians from the perspective of public and technical services practitioners in academic libraries has been discussed by Letarte et al. (2002). The authors concluded that academic libraries need librarians with a basic understanding of cataloging to provide good services to the academic community. Such competencies are critical for a variety of tasks, from interpreting bibliographic records to retrieving information. With the rapid changes in access services, resource description and knowledge organization skills will become less exclusive to catalogers and increasingly part of the competencies of acquisition, reference, and information technology staff (Calhoun, 2000).

Knowledge organization also faces challenges that LIS education programs in general are facing: the reshaping of its role and mission in light of digital information. Research studies have described the roles of digital library professionals and identified the knowledge required to be effective in digital library environments (Choi & Rasmussen, 2006; Tanner, 2001). Traditional librarian competences need to be integrated and expanded with new skills. Core competencies and skills that digital library professionals must possess include a combination of information technology, content management, and organizational management (Brancolini & Mostafa, 2006).

The practice of knowledge organization and representation is at the core of digital librarianship. The 5S model developed by Fox and his students at Virginia tech (Gonçalves, Fox, Watson and Kipp, 2004) provides a theoretical foundation for digital library programs through the dimensions of Structure, Scenario, Spatial, Society, and Stream. Knowledge organization methods, tools, and practices are an intrinsic part of this framework. In particular, ‘catalog’, ‘structural metadata’, ‘descriptive metadata’, and ‘taxonomy’ are related to the Structure element, while ‘indexing’ is inherent in the Space element.
The *Curriculum Development for Digital Libraries*, an ongoing project developed by the Virginia Tech Department of Computer Science and the University of North Carolina School of Information and Library Science, identified ten core topic areas in Digital Library research and education (Pomerantz, Oh, Yang, Fox, & Wildemuth, 2006). Knowledge organization corresponds to module 4 with four additional sub-modules containing related topics such as metadata, ontologies, controlled vocabularies, and bibliographies.

In a workshop on digital libraries education at the Joint Conference on Digital Libraries (JCDL) in 2006, Smith and Rasmussen reported on a study of the specific knowledge required of future digital library professionals (Brancolini & Mostafa, 2006). The study revealed that metadata and markup languages are among the most important and desired information technology knowledge in digital librarianship. The role of metadata in relation to cataloging is at the center of an interesting discussion taking place within the education community, as recent threads on the EDUCAT list illustrate (http://www.loc.gov/catworkshop/eduCAT/index.html). What should the core competencies in the areas of cataloging and metadata be and how should we balance the more traditional cataloging education with that needed for metadata? In the workplace, roles are blurring as we see metadata librarians increasingly included in technical service departments while catalogers are more and more involved in digital projects as metadata creators (Boydston & Leysen, 2006).

Research specifically focused on today’s knowledge organization teaching and learning is scarce. One of the few studies was conducted by Morgan & Bawden (2005) on academic institutions, employers, and educators in the U.S., UK, and Australia. Literature and course content were analyzed and the study’s findings exposed an unexpectedly wide appreciation for theory that was generally regarded as more important than practice. While the types of skills and range of competences tend to change rapidly, a sound conceptual background as gained in formal education was highly valued by most respondents, included employers. As for the topic areas, cataloging and classification, which included taxonomies and ontologies, were regarded as the core of knowledge organization, while abstracting was considered less relevant than indexing because of the limited and specific employment applications.

Knowledge organization is indeed at the crux of traditional practices and emerging trends in information discovery and access. Research is underway to determine which existing bibliographic standards can be retooled and integrated into the complex descriptive ecosystem developed outside the library community, from metadata standards to folksonomies. Researchers agree that the critical role that access mediation plays in dynamic digital environments requires the adoption of different approaches to knowledge organization (Chowdhury & Chowdhury, 2007). A critical review of these approaches as well as a sound theoretical grounding that would enable students to evaluate existing technologies is the key to providing “excellent KO” (Hjørland, 2007).

### 3.0 Research Questions

To educate future LIS professionals to meet the demands of the twenty-first century workplace, it is necessary to identify what pre-requisite knowledge is relevant to the emerging job market for digital librarians. To meet this objective, the following questions were posed: Is the knowledge organization curriculum responsive to the evolving areas of expertise required of today’s information professionals? Do knowledge organization courses reflect the variety of systems, methods, and tools necessary to harness knowledge in new information environments? What are the competencies that the new generation of information professionals needs to learn to be effective in the workplace?

To explore these questions a pilot study was designed to assess the status of entry-level knowledge organization education in U.S. library and information schools. The study involves the analysis of data from three sources: course content, workplace requirements, and students’ perception. The results serve as a framework for discussion about the role knowledge organization education should play in digital library education. Moreover, the findings may help to inform the design of knowledge organization courses so they better meet the needs of digital library workplace.

4.0 Methodology

The study employs three data sources including 1) syllabi of knowledge organization courses, 2) a survey of current LIS students, and 3) job descriptions of currently advertised positions on popular LIS job lists. Each source was intended to offer perspectives on knowledge organization education derived from different components of the LIS education community: educators, through the syllabi; LIS students, through a survey; and employers, through job ads.

At the time of this writing, data have been collected and analyzed from course syllabi and a student survey. There was not a sufficient number of relevant job descriptions posted in the time between the start of the study and now to analyze but collection is ongoing.

4.1 Syllabi of Knowledge Organization Courses

Eight syllabi were collected from knowledge organization courses offered in the 2008 spring semester by the ten-top library schools in North America, as identified by U.S. News & World Report latest rankings (2006) (see list below). The sample was based on the method adopted by Xie & Cool (1998) and Nicholson (2005) and was kept intentionally small for the purposes of the pilot study.

- University of Illinois at Urbana-Champaign
- University of North Carolina at Chapel Hill
- Syracuse University
- University of Washington
- University of Michigan at Ann Arbor
- Rutgers University
- Indiana University at Bloomington
- University of Pittsburgh
- University of Texas at Austin
- Florida State University
Five syllabi were openly accessible from the institutional website. Three were obtained through direct request to instructors via email. One of the ten schools did not offer the course this semester and was therefore not included. Table 1 lists the University and the title of the knowledge organization course.

Table 1: LIS Schools and knowledge organization courses offered in Spring 2008

<table>
<thead>
<tr>
<th>University of North Carolina at Chapel Hill</th>
<th>Organizing Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syracuse University</td>
<td>Course not offered in Spring 2008</td>
</tr>
<tr>
<td>Rutgers University</td>
<td>Organizing Information</td>
</tr>
<tr>
<td>Indiana University</td>
<td>Representation and Organization</td>
</tr>
<tr>
<td>University of Pittsburgh</td>
<td>Organizing Information</td>
</tr>
<tr>
<td>University of Pittsburgh</td>
<td>Organizing Information (offered online)</td>
</tr>
<tr>
<td>University of Texas at Austin</td>
<td>Organizing Information</td>
</tr>
<tr>
<td>University of Texas at Austin</td>
<td>Organizing and Providing Access to Information</td>
</tr>
<tr>
<td>Florida State University</td>
<td>Information Organization</td>
</tr>
</tbody>
</table>

A content analysis of the syllabi was conducted with the primary goal of identifying the range and the frequency of topics addressed. There were 336 assigned readings, 320 required and 16 optional, including journal articles, book chapters, and webpages from the eight syllabi. The readings were compiled and mapped onto corresponding individual sessions and relative schools. They were then examined and indexed with descriptors representing their subject matter. One index term was assigned to each reading for a total of 42 index terms.

4.2 Survey of Current LIS Students

An informal survey was administered at the end of the Fall 2007 to a convenience sample of students from two sections of the knowledge organization graduate course (LIS 653) at the School of Information and Library Science at the Pratt Institute. Knowledge Organization (LIS 653) is a required graduate course at the Pratt Institute where four to five sections are regularly offered each semester. The two sections introduced students to an array of topics including traditional bibliographic standards (from AACR2 and MARC21 to Dewey Decimal Classification and Colon Classification), metadata standards (from Dublin Core to EAD and Cataloging Cultural Objects (CCO)), and such emergent descriptive practices as folksonomies. The course addressed both theory and applications with an emphasis on classification theory and the analysis of new developments in OPAC interfaces. Additional areas and emerging themes in the field of information organization (e.g., personal information management and information visualization) were explored as group projects. The purpose of the survey was to include the students’ perspective on knowledge organization coursework.

The online survey was sent via email to a pool of thirty students enrolled in two sections of the knowledge organization course (LIS 653) at the School of Information and Library Science at the Pratt Institute (eighteen from LIS 653 section 4 and twelve from LIS 653 section 5). The survey was administered three days after the final grades had been posted. The content of the survey questions did not overlap with the standard institution questionnaire and every effort was made to preserve the anonymity of the students.
Sixteen responses were collected. The survey included ten questions focusing on the course content and students' learning experience (see Appendix A). Three questions required ranked answers according to a four and six-point scale. Nine questions required free-text comments.

4.3 Job Descriptions

The research project will include the collection and analysis of job descriptions from current job ads posted on online and in print journal advertisements. As previously noted, at the time of this writing an insufficient number of relevant job ads had been posted to analyze. Data collection is ongoing. The purpose of analyzing job descriptions is to identify some of the core competences and responsibilities sought by employers in the area of knowledge organization.

5.0 Data analysis and Results

5.1 Syllabi Analysis and Discussion of Results

The range of topics addressed in the course syllabi is far broader than traditional cataloging and classification classes (see Figure 1 and Appendix B). The results indicate that a significant portion of the courses are dedicated to topics that have direct implications for digital libraries, with metadata at 42 occurrences (13%) and indexing at 36 occurrences (11%) topping the list. Issues of indexing are also identified at a more granular level with automatic indexing (6 occurrences) and image indexing (5 occurrences).
Two allegedly conflicting topics are among the most popular: controlled vocabularies (20 occurrences or 6%) and folksonomies (15 occurrences or 4%). Besides folksonomies, a number of new subject areas and emerging technologies directly related to digital networked systems are covered in length including ontologies (8 occurrences), semantic web (8 occurrences), and web 2.0 (3 occurrences).

Issues of system design and usability are well represented including information retrieval (14 occurrences), information seeking behavior (9 occurrences), information system design (4 occurrences), database design (3 occurrences), information architecture (2 occurrences), human-computer interaction (2 occurrences), user interface design (1 occurrence), and online library catalogs (1 occurrence).

Knowledge representation for digital materials is addressed through an array of topics including markup languages (7 occurrences), data models (3 occurrences), and encoding standards (2 occurrences). Traditional bibliographic methods and systems are covered including bibliographic classification systems (13 occurrences), subject analysis (9 occurrences), and bibliographic control (8 occurrences).
In general, a wide spectrum of options in terms of organization and representation techniques and practices geared toward digital library applications are offered with an emphasis on mediating tools like taxonomies, thesauri, ontologies, and facet classification systems. Theoretical background is addressed in various instances including information theory (15 occurrences), classification theory (13 occurrences), organizational theory (7 occurrences).

The course readings were also computed and a core of 12 readings was identified among the ones occurring more than twice. Table 2 shows the list of the 12 most popular readings and their frequency.

<table>
<thead>
<tr>
<th>RANK</th>
<th>CORE READINGS</th>
<th>OCCURRENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Hunter, E. J. (2002). Classification made simple. Aldershot, Hants: Ashgate.</td>
<td>6</td>
</tr>
</tbody>
</table>

The breadth and scope of the topics covered in the sample of knowledge organization course syllabi examined suggests that U.S. LIS programs are responsive to the developments in the field of knowledge organization and to the requirements of digital library education. Traditional library practices coexist with methods and tools for organizing and representing digital information, although new practices and emerging technologies are more widely represented. The set of core readings identified seem to reflect this tendency.
5.2 Student Survey Analysis and Discussion of Results

Eleven students (68.8%) reported that the course was very helpful in relation to their career plans. According to one student, “It gave me a very good sense of how knowledge had been organized, traditionally in the library, and what kind of challenges we face to bring organization and access to the digital format”; “It was great to have an overview not only of traditional library tools (DDC, LCC), but also of new developments. I got a good sense of what’s possible.” In relation to the whole curriculum, the course was viewed as more challenging than most courses by ten students (62.5%) and had considerably increased students’ interest in the areas of knowledge organization for 11 students (68.8%). Students major preferences of the course included working in a hands-on environment; using digital formats; covering current topics; discovering the variety of topics related to knowledge organization; understanding topics relevant to the future of the profession. In general, students appreciated the balance used to address traditional cataloging practices against the new knowledge organization systems. Students who indicated they had work experience in libraries or other types of information centers valued the “practical underpinning of the profession.” A few appreciated the course’s coverage of theoretical issues, in particular “theory and history readings and discussions.”

The most common cause of dissatisfaction was the amount of information covered. One student commented, “At first I thought some of the information was over-explored and there was so much to read and process.” Another respondent would have liked to know “exactly what information was the most important.” One student regretted “not to have spent more time with social tagging and tools that can be used in public libraries rather than mostly tools for archival and academic institutions.”

On the other hand, two students would have liked to receive more traditional and basic cataloging training. One respondent commented, “Since I feel I don’t know enough about it to know for certain whether I would either enjoy doing it professionally or even enjoy taking a course on cataloging.” When asked about topics and skill they would have liked to know more about, responses indicated a clear preference for topics related to digital libraries, including new and emerging research areas. Students expressed an interest in learning more about web cataloging, ontologies, topic maps, and information visualization. One student wanted to know more about the history of classification and non-Western methods of organizing information.

As for the skills they would have liked to acquire, overall respondents believed they received appropriate and useful skills: “I think the skills I gained were adequate and appropriate for the course”. Four students wished they had received “more cataloging skills”; other desired skills included experience with markup languages and ontology development, recognizing however the limitation of the scope of an entry-level course.

From the analysis of the survey, it appears that students recognize the importance that both theory and working knowledge have for their education and their professional development. It is also apparent that the transitional status of the discipline, from cataloging and classification to digital resource development and emerging trends, creates a range of contrasting expectations.
6.0 Limitations of the Study

The author recognizes a number of limitations of the study. Regarding course syllabi, the sample is not representative of the entire population of LIS programs in the U.S. so results cannot be generalized. This exploratory study can however serve as a pilot and layout the ground for a large-scale investigation of 57 ALA-accredited LIS programs in U.S. and Canada. As the study progresses and more syllabi become available, the list of index terms representing topics will be further developed to an appropriate level of granularly and consolidated with a possible mapping to the ASIS&T thesaurus of information science. Another limiting factor is the fact that syllabi provide only a partial picture of what is actually covered in the classroom where a variety of instructional materials and other educational opportunities contribute to the learning experience.

As for the student survey, the small number of participants and the sampling methodology clearly limit this segment of the study. As a consequence, results cannot be generalized and are intended to provide preliminary anecdotal evidence. Rather, the data from the survey is meant to offer a snapshot of LIS student perspective on knowledge organization curriculum, which might inform further development as the project evolves.

7.0 Conclusions

Developments in digital technology have deeply impacted the way we represent and access information. As a consequence, knowledge organization education is, as are many areas of LIS programs, in a transitional phase between traditional and emerging information organization practices, standards, and tools.

This study is intended to offer some preliminary insight on the state of today's knowledge organization education through a multi-tiered approach. Through the analysis of current syllabi, the study shows the occurrences of topics addressed in today's knowledge organization education in the top-ranked U.S. LIS schools and offers evidence of the progressive alignment with digital library education. The analysis of a survey of current LIS students offers a perspective of knowledge organization from the teaching target. The analysis of job descriptions where knowledge organization skills are involved will help to identify the competences required by future information professionals in the workplace.

The general goal of the study is to provide a context for a broader discussion of the characteristics that knowledge organization education should have to meet the challenges of a profession and a discipline in flux. While this work will continue, additional studies are needed to fully investigate how LIS education can meet the changing needs of an evolving profession.

References

http://grad-schools.usnews.rankingsandreviews.com/grad/lib/search


Appendix A

Student Survey

1. In what kind of organization would you like to work (e.g., academic library, software engineering company, publishing house, etc.) and what kind of work would you like to do?

2. Was this course helpful to your career plans?
   - ___ not applicable
   - ___ very helpful
   - ___ somewhat helpful
   - ___ not helpful

If you did find in helpful, please describe how?

3. I was challenged by this course…
   - ___ not applicable
   - ___ much more than most courses
   - ___ more than most courses
   - ___ about the same as others
   - ___ less than most courses
   - ___ much less than most courses

4. My interest in the area of Knowledge Organization has increased...
   - ___ not applicable
   - ___ much more than most courses
   - ___ more than most courses
   - ___ about the same as others
   - ___ less than most courses
   - ___ much less than most courses

5. What did you like most about this course?

6. What did you like least about this course?

7. Are there topics you would have liked to learn more about? (If yes, please describe.)

8. Are there specific skills you would have liked to have gained?

9. How would this course be improved?

10. After completing this course, how would you define Knowledge Organization?
## Appendix B. Frequency of Course Syllabi Topics

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>OCCURRENCES</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  metadata</td>
<td>42</td>
<td>13%</td>
</tr>
<tr>
<td>2  indexing</td>
<td>36</td>
<td>11%</td>
</tr>
<tr>
<td>3  controlled vocabularies</td>
<td>20</td>
<td>6%</td>
</tr>
<tr>
<td>4  folksonomies</td>
<td>15</td>
<td>4%</td>
</tr>
<tr>
<td>5  information theory</td>
<td>15</td>
<td>4%</td>
</tr>
<tr>
<td>6  classification</td>
<td>14</td>
<td>4%</td>
</tr>
<tr>
<td>7  information retrieval</td>
<td>14</td>
<td>4%</td>
</tr>
<tr>
<td>8  classification theory</td>
<td>13</td>
<td>4%</td>
</tr>
<tr>
<td>9  thesauri</td>
<td>13</td>
<td>4%</td>
</tr>
<tr>
<td>10 bibliographic classification systems</td>
<td>13</td>
<td>4%</td>
</tr>
<tr>
<td>11 faceted classification</td>
<td>10</td>
<td>3%</td>
</tr>
<tr>
<td>12 information seeking behavior</td>
<td>9</td>
<td>3%</td>
</tr>
<tr>
<td>13 subject analysis</td>
<td>9</td>
<td>3%</td>
</tr>
<tr>
<td>14 authority control</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>15 bibliographic control</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>16 ontologies</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>17 semantic web</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>18 markup languages</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td>19 organizational theory</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td>20 subject heading systems</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td>21 automatic indexing</td>
<td>6</td>
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</tr>
<tr>
<td>22 bibliographic standards</td>
<td>6</td>
<td>2%</td>
</tr>
<tr>
<td>23 personal information management</td>
<td>6</td>
<td>2%</td>
</tr>
<tr>
<td>24 image indexing</td>
<td>5</td>
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</tr>
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<td>25 digital libraries</td>
<td>4</td>
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</tr>
<tr>
<td>26 information system design</td>
<td>4</td>
<td>1%</td>
</tr>
<tr>
<td>27 data models</td>
<td>3</td>
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<td>28 database design</td>
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<td>29 library cataloging</td>
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</tr>
<tr>
<td>30 web 2.0</td>
<td>3</td>
<td>1%</td>
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<tr>
<td>31 abstracting</td>
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<tr>
<td>32 encoding standards</td>
<td>2</td>
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<td>33 human-computer interaction</td>
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</tr>
<tr>
<td>34 information architecture</td>
<td>2</td>
<td>1%</td>
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<tr>
<td>35 arrangement and display</td>
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<tr>
<td>36 bibliographic description</td>
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<td>0.3%</td>
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<tr>
<td>37 bibliographic standards</td>
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<td>0.3%</td>
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<td>38 information organization history</td>
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<td>39 knowledge representation</td>
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<tr>
<td>40 online library catalogs</td>
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</tr>
<tr>
<td>41 taxonomies</td>
<td>1</td>
<td>0.3%</td>
</tr>
<tr>
<td>42 user interface design</td>
<td>1</td>
<td>0.3%</td>
</tr>
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</table>