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## Subject Analysis of Online Syllabi in Library and Information Science: Do Academic LIS Programs Match with Job Requirements?

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### **Abstract:**

The Web contains new potential sources of quantitative data that could be used to explore different aspects of library and information science profession. In this article the extent to which online syllabi and job announcements could be valuable sources to determine how the contents of LIS academic courses match with the existing job requirements in the libraries is assessed. A content analysis was conducted for both online course syllabi presented by 30 LIS schools in 12 countries and the sample of 200 current LIS job advertisements. These online syllabi and job positions were analysed for the number of occurrences of subjects and were classified in to the 32 pre-defined categories. The results indicated that about 70% of subjects extracted from the course contents matched with the requirements and skills mentioned in the LIS occupations. However, there were remarkable gaps for about 30% of subject areas such as "management of libraries", "interpersonal communication", "academic libraries", "metadata creation and coding", "financial issues in libraries", and "digital libraries", suggesting that these subjects did not appear to have much representation or weight in the many LIS programs, but they were requested as the essential qualifications by the LIS employers. A slight but significant correlation ( $r=0.400^*$ ) was found between the number of occurrences of subjects in the LIS courses and job descriptions, indicating that subjects more represented in the LIS academic programs also had higher demands in the current job market and vice versa. Finally, although significant trends were found, there were also several methodological and subjective limitations, suggesting that more qualitative investigations are needed to validate the quantitative results.

# 1. Introduction

An academic syllabus describes different aspects of a course, ranging from its goals and assessments to its time schedule and required facilities and resources. It provides details about the roles of both students and instructors in the learning and assessment process (Habaneck, 2005) and acts as a teaching contract between them (Parkes & Harris, 2002). There is evidence that a well-structured syllabus can lead to more effective teaching and learning (Behnke & Miller, 1989). Several studies have used syllabi for evaluative purposes such as mapping the scholarship and the effectiveness of teaching (Albers, 2003), evaluating faculty teaching (Seldin, 1998), library use analysis (Williams, Cody & Parnell, 2004) or tracking of the spread of particular topics in university teaching (e.g., Kerr, Patti and Chien, 2004; Stapleton and Leite, 2005). There was a 25% increase from 1996 to 1999 in U.S. college faculty utilizing Web resources in their class syllabi (Bonk, 2001. p.14), indicating that online syllabus seems to have become popular over the past decade. The question to be addressed here is how emerging Web-based educational sources like online syllabi can be used for better academic learning/teaching environment, controlling educational costs and promoting job opportunities.

Although, much has been written about the value of syllabi in the teaching context, less study has used both online syllabi and job advertisements to explore how LIS academic programs match with the existing job requirements. In fact, decisions have to be made occasionally by LIS schools or departments for introducing new courses or changing the existing programs (see Clyde, 2002). A number of studies have analysed LIS job advertisements for assessing the content of the required job opportunities, skills and qualifications as well as their changes over time (e.g., Callison & Tilley 2001; Cronin, Stiffler & Day, 1993). Some researchers have also investigated how LIS jobs have changed in response to changing information technology (e.g., Heimer, 2002; Marion, 2001; Xu, 1996;).

Xu (1996), for instance, analysed job announcements in American libraries (1971-1990) to examine the impact of library automation on job requirements for cataloguers and reference librarians, finding growing demand for computer-based skills and qualifications related to cataloguing and reference services. Marion (2001) also analysed 250 online academic library job advertisements posted during 2000 to determine current requirements for technologically oriented jobs finding that technical skills, interpersonal and behavioural skills and service delivery competencies were dominating requirements in the LIS occupation.

Heimer (2002) and Croneis & Henderson (2002) in two separate studies examined job advertisements both in American libraries for the period 1989-1998 and 1990-2000 respectively. They both concluded that the emerging responsibilities of electronic librarianship in the LIS job market were growing and librarians should acquire some promising experiences surrounding these new subject areas.

Clyde (2002) analysed the contents of 291 library and information science advertisements posted to the LIBJOBS listserv on the IFLA website (as of early 2002) for professionals with knowledge or skills related to user education and information literacy instruction and found that more than half of the advertisements (150) required at least some experience of and/or skills in user education of some kind.

More recently, Marion, Kennan, Willard & Wilson (2005) conducted a content analysis and co-word analysis of 395 job advertisements from academic, public and special libraries in Australia and the USA from August to October 2004 in order to investigate similarities and differences between the two countries. They used 18 broad categories to analyse the subjects from the job ads and found that interpersonal skills, behavioural characteristics were identified as critical requirements in both countries.

It seems that no previous study has directly compared the number of occurrences of particular subjects represented in LIS courses in different geographical regions against the skills or qualifications mentioned in job advertisements for the purpose of this study.

## **2. Research Questions**

The main objective of this research was to give general view of how LIS students are getting the jobs they expect after graduation and if libraries are getting the required LIS skills or qualifications they expect from the new graduate employees. For this purpose, the following research questions were devised:

1. What are the common subjects represented in the LIS academic programs based upon the number of occurrences of topics appeared in the online course syllabi?
2. What proportions of subjects represented in the LIS courses match with the required skills, knowledge or qualifications in current online job advertisements? In which subject areas there are significant differences?
3. Is there significant statistical correlation between the number of occurrences of subjects in the LIS course syllabi and job requirements? Do subjects highly represented in LIS programs also highly demanded in the existing LIS job market and vice versa?

One practical method might be quantitative comparison between the number of occurrences of subjects represented in LIS courses and job announcements in order to identify emerging demands in the LIS workplace. Hence, online course syllabi offered by 30 library and information schools or departments in 12 countries in America, Europe, Asia and Oceania were analysed. A random sample of 200 current LIS job advertisements on the Internet were analysed and the required skills or qualifications presented by libraries or information centers categorised. Both online syllabi and job advertisements were analysed for the number of occurrences of particular subjects and were classified into 32 pre-defined categories. By exploring the content of online syllabuses, it is intend to discover how the altering job requirements in the LIS profession match with current academic programs.

## **3. Data Collection Method**

### ***3-1. Selection of Universities and LIS Departments***

The World List of Schools and Departments of Information Science (<http://informationr.net/wl/>) was used for locating LIS programs. This is one the most comprehensive international directories of schools and departments of information science, information management and related disciplines. For the purpose of this study, we only selected library and information science programs and excluded other related programs such as information management and information technology

programs. The factors that were considered when selecting LIS schools are described below.

The study was limited to those LIS schools or departments which had online English language course syllabi. Hence, to keep the project manageable, syllabi in non-English languages (e.g., French, German, Chinese, and etc) were ignored and those which were not available online. Course syllabi were selected if their content description were presented clearly. Moreover, for the practical reasons it was decided to cover LIS programs in only 12 countries from America, Europe, Asia and Oceania to cover a relatively sufficient range of geographical regions (see Table 1). A pilot study of a sample of 50 online LIS job advertisements showed that many LIS positions were related to libraries and information centres in the United States, Canada, and the United Kingdom respectively. For this reason, it was decided to take a proportional sample to select more LIS programs from above countries. For practical reasons regarding different languages LIS schools from other countries (e.g., France, Germany, and Russia) were ignored in the sample to keep the study manageable. This limitation is mentioned again in the discussion.

Ultimately, 30 LIS schools or departments representing library and information science programs from the United States, Canada, UK, Norway, India, Japan, Malaysia, South Africa, Taiwan, Korea, New Zealand and Australia were chosen. The data in Table 1 shows the selected countries and the associated LIS schools or departments for each of them.

**Table 1. Selected countries and their associated LIS schools or departments**

United States of America (12)	Canada (4)	UK (3)	Norway (1)	New Zealand (1)	Australia (1)
University of Arizona; Florida State University; University of Washington; San Jose State University; University of South Florida; University of Hawai'i at Mānoa; UCLA; University of South Carolina; Catholic University of America; Rutgers University; Oklahoma University; University of North Texas;	University British Columbia; McGill University; University of Alberta; Western Ontario;	University of Sheffield; London's Global University; Loughborough University;	Oslo University College	Victoria University	Charles Sturt University
India (3)	Japan (1)	Malaysia (1)	Taiwan (1)	South Africa (1)	Korea (1)
University of Delhi; Kurukshetra University; Panjab University	Keio University	International Islamic University Malaysia	National Taiwan University	University of the Western Cape	Yonsei University

\*Figures in brackets indicate number of the studied LIS programs for each country

### **3-2. Subject analysis of online LIS course syllabi**

A content analysis approach was conducted to explore the explicit topics presented in the courses. The course contents and descriptions were read and the number of occurrences of subjects was classified based upon the pre-defined classification scheme. An inductive content analysis methodology was chosen for manual assignment of subjects appeared in the courses. However, senior LIS lecturers were also consulted for the initial classification scheme of a sample of LIS programs. Then, the preliminary results from the classification of sample programs were discussed in order to reach an overall agreement on the classification scheme. In some cases pre-defined categories were modified to cover new topics in the LIS courses

identified during the manual checking of the online syllabi. All syllabi presented by the selected LIS schools were manually checked and the main topics of them were classified into 32 classes (see Table 2).

The content of the syllabi was separately classified by two classifiers (first and second authors); hence we did not reach general cross-agreement on the classification exercise. Nevertheless, we discussed about classification procedure in order to improve the agreement on classification consistency. The major purpose of the classification process was to discover and identify apparent and explicit topics that were mentioned in the LIS syllabi.

However, it is not known how lecturers might cover a specific topic in the teaching context (e.g., the depth and the quality of teaching). Thus, this study is a quantitative approach utilising frequency counts of subjects presented from words and phrases in the course descriptions. Therefore this can also be another limitation of the current study which springs from subjective characteristic of the classification process. For instance, content analysis of the course description below, from an LIS program shows that students may acquire general or practical knowledge/skills about the following subject areas after graduation (see underlined words), although the quality and intensity of topics presenting by LIS lectures were not known: 1) *information technology* 2) *computer networking* 3) *web programming languages* 4) *web site design*.

***Information Technology Tools and Applications:*** *This course focuses on building practical skills in a variety of networked computer applications. The applications are studied within the framework of how they enable us to structure, store, process, access, and present information. The topic may vary from semester to semester but will typically include networking and Internet applications, Web coding languages such as DHTML and XML, designing and building Web sites, and working with CGI*

The number of occurrences of subjects from an individual course syllabus was recorded and classified into the 32 pre-defined categories (see Table 2). This approach helped to an understanding of how LIS students may acquire practical skills or knowledge which might be essential for a LIS occupation. In many cases one broad category was used to classify different topics mentioned in the courses. For instance, the broad category "***organization of information***" was used to classify the following topics in the courses such as cataloguing and classification (e.g., AACR2 rev., LCSH, LC classification, USMARC formats, etc.), indexing and abstracting, vocabulary control, and etc. Table 2 shows the classification schemes applied for subject classification of LIS online syllabi. However, the classification was limited to what was explicitly mentioned in the course syllabi. In some cases it is possible that courses omit some details about different aspects of topics and such an omission of details could have influenced the overall results.

**TABLE 2. Classification scheme used for subject analysis of LIS online syllabi.**

<b>Organization of information</b> (e.g., theories, systems, and practices of cataloguing and classification; indexing and abstracting; AACR2 rev., LCSH, LC classification, USMARC formats, etc.)
<b>Reference and information services</b> (e.g., information resources and their use in libraries and information services; reference theories, principles and practices; general reference work; information sources in science, social science and humanity, and etc.)
<b>Collection management, development and acquisitions</b> (e.g., principles and practices in selecting, evaluating, and managing collections in all types of libraries and information formats; identification of reliable print resource, databases; Information resource development; building and maintaining collections)

<b>Children and youth services and Literature</b> (e.g., children and young adults and reading; evaluation of both print and non-print materials for children and young adults, from birth to age twelve including multicultural materials; reader's advisory; storytelling: art and techniques)
<b>Information searching and retrieval</b> (e.g., principles and techniques for the offline and online searching in the databases and Internet sources including search engines and online and CD-ROM databases; considerations in computer-based information retrieval systems, including conventional inverted file systems and using Boolean logic)
<b>Libraries and information in society</b> (e.g., legal, cultural and ethnical considerations of information sources and services in knowledge based societies as well as information policy, economics of information and information industries; copyright, societal issues affecting libraries and librarians; information access and funding issues.)
<b>Information technologies in libraries</b> (e.g., the concepts and applications of computer and Internet-related information technology in libraries and information services such as computing basics, information transfer, networks, library information systems, library automation, artificial intelligence applications)
<b>Management of libraries</b> (e.g., management and administrative principles and practices; problem-solving, public relations and program development. Theories and practices in information organizations planning, organizing, staffing, directing, and control; group team management; organizational leadership; conflict and agreement)
<b>Digital collections</b> (e.g., electronic publishing issues and opportunities such as internet resources, electronic journals, open access publishing and digital images and collections)
<b>Information behavior/seeking in libraries</b> (e.g., theoretical and professional base for information behavior and user evaluation, information seeking, human-computer interfaces as well as physical and cognitive behavior in interaction with information systems)
<b>Archival /manuscript management</b> (e.g., archival/manuscript principles and management theories applicable to all types of repositories such as digitization, description, standards and profession)
<b>Information / knowledge management</b> (e.g., systems analysis and project assessment in libraries. Evaluation of library and information services and systems)
<b>Information literacy / instructional techniques in libraries</b> (e.g., education theory and instructional techniques in libraries. Web-based instruction and/or design Web-based learning modules and for end-users.
<b>Preservation and conservation</b> (e.g., introduction to the preservation of library materials, including an overview of physical and chemical deterioration of manuscript, printed, and electronic materials)
<b>Metadata creation and encoding</b> (e.g., principles supporting the development and implementation of metadata schemes, focusing on issues of interoperability, internal and external standardization, and evaluation such as Dublin Core EAD, METS, MODS, OAI, XML)
<b>Computer programing</b> (e.g., general knowledge of programing languages for information systems and Web applications such as MySQL, Java, XHTML, HTML, and etc)
<b>Database design, development and management</b> (e.g., theory, methods, and techniques widely used today to design, develop, and maintain a database system. Designing and creating databases from the viewpoint of information specialists and content providers. General knowledge about development of Web-based databases)
<b>Web site design and content development</b> (e.g., designing and maintaining Web pages for libraries and information services including practice with web site creation with HTML and Dynamic HTML and content management of Web sites)
<b>Marketing and business environment of libraries</b> (e.g., approaches to planning and marketing library products/services. Market analysis, use surveys, and market targeting)
<b>Security of information systems</b> (e.g., introduction to the concepts, policies, and issues associated with digital computer and network security and the skills necessary to assess and improve the security of servers, desktop systems, and digital networks)
<b>Government information</b> (e.g., familiarity with governmental documents and information services at the federal, state/local and international levels in all formats)
<b>Financial issues in libraries</b> (e.g., prepare and monitor collection budget and fiscal management based upon the financial information and tools)
<b>Digital libraries</b> (e.g., issues, problems, and approaches to digital libraries. Variety of digital library collections; organization, access, and use of digital libraries. Technical infrastructure, storage, organization, and preservation in digital libraries)
<b>School libraries</b> (e.g., role of school library media centers in the educational program; planning, organizing and administering library programs; understanding how to integrate the library media program)
<b>Academic libraries</b> (problems and issues of organization and management of university, college and community college libraries such as technical, student, and teaching the staff services)
<b>Public library</b> (e.g., issues related to administration, services, resources, facilities, financing and staffing in the public library sector)
<b>Law libraries</b> (e.g., collection development, library administration, teaching legal research, professional ethics and intellectual property issues in the law libraries)
<b>Special libraries</b> (e.g., issues related to administration, services, resources, facilities, financing and staffing in the special library sector)
<b>Medical/health information services</b> (e.g., information systems and services particularly used in health and medical settings)

<b>Scholarly communication and bibliometrics</b> (e.g., the process of scholarly and scientific publishing, Scholarly communication structure, bibliometrics, informetrics, and scientometrics analysis)
<b>Computer networks / network administration</b> (e.g., skills necessary to perform competently in the role of network administrator or network system manager within a library and/or information center environment including design, operation, and management of networked systems from local area networks to the Internet)
<b>Interpersonal communication</b> (e.g., the principles, practices and strategies for understanding and improving interpersonal interactions, professional-client interactions, dealing with problem users and situations)

### 3-3. Selection and content analysis of LIS jobs requirements

A sample of 200 online LIS job advertisements deposited within February–March 2008 on the web was selected. Several websites were used to include LIS jobs in the 12 studied countries (see Table 1). An independent website related to LIS jobs for Japan, Malaysia, South Africa, Taiwan, and Korea could not be located. Therefore, either job vacancies on the university websites or a search of the related keywords (e.g., LIS OR library jobs Japan) in Google search engine were used.

Proportional sampling was applied for each country so that countries with more LIS jobs on the web had more samples in the study. Examples of key web sites where the most recent LIS jobs were extracted are listed below. Note that only English language job advertisements were studied and then only if they had sufficient information about job requirements, skills or qualifications. Ultimately, the number of occurrences of subjects mentioned in job announcements based upon the previous classification scheme used for subject analysis of the LIS courses was classified (see Table 2). The websites searched were:

- American Library Association (<http://www.ala.org/>)
- Canadian Library Association (<http://www.cla.ca/>)
- Australian Library and Information Association (<http://alia.org.au/employment/vacancies/>)
- IFLA LIBJOBS (<http://www.ifla.org/II/lists/libjobs.htm/>)
- LISjob.com (<http://www.IISjob.com/>)

An example of an LIS job advertisement posted on the web is given below.

*"Digital Services Librarian" in The Georgetown University Library, Washington, DC, USA, posted 03 Mar 2008*

**Requirements:** ...experience working with an Integrated Library System, MetaSearching system, and/or Open URL Resolver; minimum of 2 years experience developing applications in MySQL, Java, \_javascript\_, and/or PHP; minimum of 1 year experience with XHTML, HTML, CSS, XML and/or XSL; demonstrated knowledge of digital library standards, technologies, and techniques; demonstrated knowledge of current advances in information systems and technologies and their applications in libraries, education, and research; strong analytical, interpersonal, and communication skills; ability to work effectively with a team.

The required skills mentioned in this job were classified as:

- 1) Information technologies in libraries
- 2) Information searching and retrieval
- 3) Computer programming
- 4) Digital libraries
- 5) Interpersonal communication

## 4. Results

### 4-1. Subject Analysis of LIS Courses and Job Requirements

The main findings with the subject analysis of online syllabi represented by 30 LIS schools and the sample of 200 LIS jobs posted online within February-March 2008 are reported in Table 3. The second and third columns in Table 3 following, show total number and percentage of occurrences of subjects extracted from LIS courses respectively. Note that in many case more than one subject may be recorded from an individual LIS program (i.e., organization of information). Hence, these columns also indicate the weighting of subjects. The fourth and fifth columns also report the total number and percentage of occurrences of subjects from LIS jobs descriptions. Finally, the fifth column reports the proportional differences of occurrences of subjects between the LIS courses and jobs.

**Table 3. The number and percentage of occurrences of subjects in LIS courses and job ads.**

<b>Subject classification scheme</b>	<b>The number of occurrences of subjects in LIS academic courses</b>	<b>%</b>	<b>The number of occurrences of subjects in LIS online job ads</b>	<b>%</b>	<b>Difference between % occurrences of subjects in LIS courses and jobs</b>
Reference and information services	139	12.3	65	11.1	1.3
Organization of information	121	10.7	54	9.2	1.5
Collection management, development and Acquisitions	81	7.2	41	7.0	0.2
Information searching and retrieval	78	6.9	19	3.2	3.7
Information technologies in libraries	69	6.1	26	4.4	1.7
Libraries and information in society	67	6.0	5	0.9	5.1
Children and youth services and Literature	61	5.4	9	1.5	3.9
Information behavior/seeking in libraries	47	4.2	9	1.5	2.6
Digital collections	45	4.0	35	6.0	<b>-2.0</b>
Information / knowledge management	40	3.6	15	2.6	1.0
Archival /manuscript management	37	3.3	19	3.2	0.0
Management of libraries	31	2.8	45	7.7	<b>-4.9</b>
Information literacy / instructional techniques in libraries	29	2.6	19	3.2	-0.7
Preservation and conservation	28	2.5	3	0.5	2.0
Public library	23	2.0	9	1.5	0.5
Database design, development and management	21	1.9	22	3.8	<b>-1.9</b>
Medical/health information services	20	1.8	8	1.4	0.4
Web page design and content development	18	1.6	12	2.0	-0.4
Government information	18	1.6	8	1.4	0.2
School libraries	17	1.5	5	0.9	0.7
Special libraries	16	1.4	2	0.3	1.1
Computer networks / network administration	15	1.3	5	0.9	0.5
Academic libraries	15	1.3	29	4.9	<b>-3.6</b>
Marketing and business environment of libraries	14	1.2	14	2.4	-1.1
Computer programming	14	1.2	9	1.5	-0.3
Law libraries	12	1.1	2	0.3	0.7
Metadata creation and encoding	11	1.0	23	3.9	<b>-2.9</b>



<b>Digital libraries</b>	10	0.9	18	3.1	<b>-2.2</b>
<b>Budgetary and financial management of libraries</b>	8	0.7	19	3.2	<b>-2.5</b>
<b>Scholarly communication and bibliometrics</b>	8	0.7	7	1.2	-0.5
<b>Interpersonal communication</b>	7	0.6	29	4.9	<b>-4.3</b>
<b>Security of information systems</b>	6	0.5	1	0.2	0.4
<b>TOTAL</b>	<b>1126</b>	<b>100.0</b>	<b>586</b>	<b>100.0</b>	<b>0.0</b>

\*The ranking is based on the subject frequency of LIS courses (second column)

\*\*Important numbers were highlighted

Most notably, the data in Table 3 show that 12.3%, 10.7%, 7.2% and 6.9% of occurrences of subjects represented in the reviewed courses were related to 1) "*reference and information services*", 2) "*organization of information*", 3) "*collection management, development and acquisitions*", and 4) "*information searching and retrieval*" respectively. This result is not surprising, since for a long time the above topics have been the fundamental courses in the library and information science discipline. However, there were other distinctive subjects that did not appear to have significant representation in courses. These included "budgetary and financial management of libraries" (0.7%), "interpersonal communication" (0.6%), "scholarly communication and bibliometrics" (0.6%), and "security of information systems" (0.5%).

The frequency of skills and requirements mentioned in the LIS job announcements are also shown in Table 3. It shows that 1) "*reference and information services*" (11.1%), and 2) "*organization of information*" (9.2%) were also the most required skills in the LIS workplace respectively. In other words, the result indicates that the reference services and organization of information were the most required skills in LIS job market and LIS programs also provide the significant weight to these subjects. As shown in the table 3, the third most required qualification mentioned in the LIS job advertisements was "*management of libraries*" (7.7%). However, only 2.8% of LIS programs had associated courses about this topic. In fact this result suggests that there was an obvious gap between the specific knowledge and skills related to management principles and practices that are presently in demand in the LIS workplace and the existing academic programs.

#### **4-2. The Relationship between Subjects in LIS Courses and Job Announcements**

Correlation tests were applied an indirect quantitative approach to assess the extent of the relationship between weight of subjects in the LIS academic courses and job requirements. Correlation tests typically take the form of comparing two sets of numbers, revealing the extent to which larger values from one variable (i.e., subject occurrences in LIS courses) associated with larger values from the other variables (i.e., subject occurrences in LIS jobs). A high degree of correlation could indicate that one influences the other, or that the two have a common underlying influence. Since the frequency distributions of dataset were skewed the Spearman correlation test was applied (Vaughan, 2000).

Results showed that there is a slight correlation ( $r=0.400$ ;  $p < 0.05$ ;  $n=32$ ) between the frequency of subjects covered by the LIS courses and those mentioned in the LIS job announcements. This suggests that subjects with higher occurrences in the academic course content are also highly needed in the LIS profession and vice

versa. Nevertheless, a significant correlation does not imply that there is a cause-and-effect relationship between variables and follow up qualitative investigations are needed to validate the quantitative results of the research.

### 4-3. Bridging the Gaps between LIS Course Contents and Job Requirements

The data in Table 4 below compares the proportion of subjects covered by LIS academic courses and the existing job requirements. It shows that only in 9 (9 of 32 or 28%) subject areas there are remarkable\* differences between the percentage of occurrences of subjects in courses and job requirements.

**Table 4. Required job qualifications not remarkably presented by LIS courses**

	Subject frequency of LIS courses	%	Subject frequency of LIS jobs	%	Subject classification scheme
Management of libraries	31	2.8	45	7.7	-4.9
Interpersonal/communication	7	0.6	29	4.9	-4.3
Academic libraries	15	1.3	29	4.9	-3.6
Metadata creation and encoding	11	1	23	3.9	-2.9
Budgetary and financial management of libraries	8	0.7	19	3.2	-2.5
Digital libraries	10	0.9	18	3.1	-2.2
Digital collections	45	4	35	6	-2
Database design, development and management	21	1.9	22	3.8	-1.9
Marketing and business environment of libraries	14	1.2	14	2.4	-1.1

For instance, the data in Table 4 show that only 2.2% of the reviewed LIS courses had related topics about "*management of libraries*" (e.g., planning, organizing, staffing, directing, and control; group team management; organizational leadership). However, 7.7% of the studied LIS jobs had explicitly emphasized effective and strategic management skills and qualifications as requirements. This result indicates that there was a proportional difference between occurrences of subject in LIS courses and job advertisements related to management of libraries is about -5%. Another difference was related to "*interpersonal communication*". While, many LIS jobs mentioned interpersonal communication as an essential qualification, only 0.6% of the courses covered this topic. Other gaps between LIS courses and job qualifications can be identified in Table 4.

## 5. Discussion and Conclusion

This subject analysis of LIS courses based upon the occurrences of topics showed that about 37% of courses were somehow related to the four fundamental and traditional areas in the LIS discipline including reference and information services, organization of information, collection management, and information searching and retrieval. This result was not surprising since the above subjects are traditionally known as the dominant areas in the LIS discipline (Table 3). There were also

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\* We only considered subject differences more than 1% for the discussion.

emerging qualifications in LIS programs indicating new roles for librarians in the digital era. For instance, Web page design, network administration, security of information systems, computer programming, and metadata creation are among topics that expand the conventional tasks of librarians (e.g., technical and reference services) to new computing-based skills]. It therefore seems that some LIS employers need librarians to acquire general computing skills and knowledge for LIS occupations which are extensively related to computer science discipline. A likely explanation is that Web environment might be altering conventional instructional programs or the existing LIS job market and requires a person to manage both the "content" and the "structure" of LIS workplace and to perform both technical and digital librarianship tasks.

Most notably, the result showed that there were remarkable gap between required job qualifications and LIS course contents in "management of libraries" (Table 4). In other words, only 2.8% of subject occurrences in the studied LIS courses were related to management of libraries, however, this was 7.7% in the LIS jobs advertisements.

A major practical limitation of the study was the subjective issue of content analysis and classification. This quantitative investigation is limited to what is explicitly mentioned in the course syllabi and job descriptions. Since, course syllabi and job advertisements are usually very brief, they often leave out detail which may be missed and this would influence the overall results. Moreover, less is known about the quality of teaching and methods administered during LIS instruction. This could be surveyed based upon the student or faculty perceptions (e.g., interviews and questionnaires). Although significant correlation between subject frequency presented in LIS academic courses and job requirements was found, more qualitative studies are needed for direct interpretation of results. Moreover, the ambiguity of the contents presented in the studied syllabi, leaves the quantitative results somewhat open to question. Another limitation is that the job ads data was gathered over a relatively short period of times and only 30 LIS programs were analyzed. Thus, one must be cautious to generalize the results of the current study to the overall state of LIS academic education.

While there are significant limitations to this study the online syllabi and job advertisements can provide new potential sources of quantitative data for exploring the current state of required library skills in the workplace. These methods might also be useful for policy makers practically involved in LIS education, especially in the developing countries. Consequently, subject assessment of LIS courses and job advertisements allows the preparation of more cost-effective instructional programs through adding new topics into courses to meet the real needs of LIS occupation and reducing courses which have fewer demands in the ever changing job market.

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