University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Library Philosophy and Practice (e-journal)   Libraries at University of Nebraska-Lincoln

July 2014

Evaluation of Medical Librarians' Level of Information and Communication Technology Skills Based on MLA Statements: A study in Iran

Mina Tavassoli-Farahi

Health Information Management Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran ; Department of Health Information Technology, Faculty of Para-Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran, mfarahi20@gmail.com

Masoumeh Tajafari

Department of Library and Information Science, Ferdowsi University of Mashhad, Mashhad, Iran, tajafari@um.ac.ir

Iman Tahamtan

Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran., Iman.tahamtan@gmail.com

Follow this and additional works at: http://digitalcommons.unl.edu/libphilprac

Part of the Library and Information Science Commons

Evaluation of Medical Librarians' Level of Information and Communication Technology Skills Based on MLA Statements: A study in Iran

Dr. Mina Tavassoli Farahi

Health Information Management Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Assistant Professor, Department of Health Information Technology, Faculty of Para-Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

mfarahi20@gmail.com

Dr. Masoumeh Tajafari (Corresponding Author)

Assistant Professor, Department of Library and Information Science, Ferdowsi University of Mashhad, Mashhad, Iran

tajafari@um.ac.ir

Iman Tahamtan

Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

Iman.tahamtan@gmail.com

Abstract

Due to the importance of ICT skills, several leading associations have released guidelines on needed ICT skills for librarians. In this study, Medical Library Association (MLA) statements on ICT skills were used for evaluating medical librarians' level of information and communication technology expertise in Iran. A census sampling method was used. Chief Librarians working in college libraries affiliated to the Ministry of Health and Medical Education (MOHME) in Iran participated in this study. Findings showed that based on MLA's skill statements, medical LIS professionals working in medical, dental and pharmacy colleges possessed adequate skill in communications and information infrastructure including the Internet and Web; inadequate skill in integration of systems and technologies; and applications in emerging areas of biomedicine, computational biology and health information; medium skill in basic principles of automated systems, data standards, and system analysis techniques including design and evaluation; acquisition, use, and evaluation of information technologies; and technological solutions for permanent access to electronic information.

Keywords: Library and Information Science, Medical librarians, Medical libraries, MLA skill statements, Information and Communication Technology, Iran.

Introduction

Over the past decade, information and communication technologies have revolutionized human society. Social institutions such as libraries and carriers such as librarianship as a service-oriented profession have been influenced by the rapid social, cultural and technological changes. Today, the library environment and its services are entirely different from a century ago (Burke, 2002). The digital revolution has affected digital libraries and electronic materials. When the Internet was introduced, and along with development in the World Wide Web, library services and librarians' roles were fast transformed. Information and communication technology (ICT) was entered into academic and non-academic libraries, during the 1960s. Libraries, at the beginning, employed information technologies to accelerate their daily services, reduce their operation costs, eliminate uninteresting and repetitive work, avoid duplications of effort, increase the range of services, and facilitate cooperation and the formulation of networks and resource sharing (Mohsenzadeh and Isfandyari-Moghaddam, 2009; Ramzan and Singh, 2010). Information and communication technology has alerted libraries in terms of services and resources. These changes include the prevalence of electronic media, accessing information instead of ownership of documents and intermediary services rather than end-user services. These have changed library users' expectations and hence developed dramatic changes in librarian's roles. Dastgerdi (2009) contends that librarianship has been affected by developing IT and needs new skills to be utilized in the knowledge-based environment. A survey on academic medical librarians in Malaysia by Shafique (2007) reported that the electronic environment at the 21st century will demand a range of skills from librarians. To meet the current requirements, library professionals must be able to perform various tasks coupled with the changes in technological environment. These technologies enable users to have on-line remote access to library collection twenty-four hours, and several users can reach the same electronic resources simultaneously within or outside physical library, which is easy and time saving.

In order to meet the increasing and changing needs and requirements of the users more effectively and efficiently in the new information technology-driven environment and to keep pace with the ever-increasing technological changes, the Library and Information Science (LIS) professionals including medical librarians should acquire knowledge and skills in information and communication technology (Safahieh and Asemi, 2010).

Iran as a developing country has employed computerized library systems and services in the late 1970s. However, this was renovated after a long time in 1980s (Farajpahlou, 2002; Safahieh and Asemi, 2010). Eliciting Iranian medical librarians' level of skills in different areas of information and communication technology is highly required to recognize the strengths and weaknesses of their skills in this area. Medical Library Association (MLA) is the only leading medical association that has released statements on ICT skills needed for medical librarians. Hence, in this study MLA's statements on ICT skills were used as a basis for evaluating the level of ICT skills of medical librarians in Iran.

Literature review

The advent of the internet and the World Wide Web has brought a new information and social environment dramatically different from the traditional library. This has resulted in a considerable research regarding many aspects and problems of the information technology in the new environment including the types, the education needed, the skills and qualifications required, and the degree to which the profession should change. A brief overview of the related literature follows so that the findings of our research are considered in a suitable context.

Some studies have focused on the level of librarians' ICT skills. For example, Babu, Vinayagamoorthy and Gopalakrishnan (2007) examined the ICT skills among librarians in engineering educational institutions in Tamil Nadu. They indicated that participants have acquired considerable basic skills in ICT, but they needed to concentrate more on network-based services and digital library. A study by Safahieh and Asemi (2010) investigated the computer literacy skills of librarians in Isfahan University in Iran. The findings showed that though most librarians had long experience of computer use, the majority of them did not have a good level of computer skills. They suggested that to cope with the computerized libraries, librarians should be equipped with the computer skills. Tavassoli Farahi and Gandhi (2011) compared Iranian and Indian medical librarians' competencies on IT basics including email; Internet; presentation and publishing; databases; system analysis and programming. They found that all the skills listed under IT basics were considered important by medical librarians in both countries. Kattimani and Naik (2013) in their study found that librarians had more skills on web design than operation of computers, creation of files and folders, radio frequency identification, library automation software modules, various operating systems, internet-related skills and search engines. Results

indicated that financial restrictions, excessive load of work and negative attitude of the managers were major constraints on acquiring ICT skills.

Some studies have also confirmed the necessity of ICT skills for librarians. For instance, Gerolimos and Konsta (2008) investigated the qualifications and the skills of the librarian's profession through 200 job advertisements in the UK, Canada, Australia and the USA in 2006 and 2007. They identified 38 skills and qualifications through the job ads. The findings showed that degree in LIS and working experience skills were expected to be the ones with the highest percentage, followed by communication skill. According to Thomas et al. (2010), the modern academic librarians, besides the common and traditional attributes, should have the knowledge of technology and eager to learn and adopt new information technologies for the benefit of library users. Ameen (2011) investigated challenges and opportunities that librarianship has encountered in the twenty-first century due to the growing use of information and communication technologies (ICTs) in Pakistan. The study suggested that libraries in developing countries were being meaningfully affected by the existing and future ICT developments in different areas. Huvila et al (2013) used the notions of Library 2.0 and Librarian 2.0 among library professionals in Finland as a platform to discuss professional development. They found that librarian 2.0 should be Internet competent, interactive, user oriented, up-to-date, active, Internet-minded, producer, virtual, and open. Saunders (2012) found that reference librarians were indeed engaged in a wide variety of activities requiring a range of competencies and skills. It was also revealed that most academic reference librarians were engaged in multifunction positions involving both traditional and nontraditional reference activities. The results of Chawner and Oliver's study (2013) on New Zealand academic subject/reference librarians indicated that serving academic library patrons required not only traditional 'reference' skills, but also skills in customer service, technology support, and training. Good communication skills were also rated highly by the librarians, and the high value placed on adaptability/flexibility showed that most respondents expected their roles to continue to change in the next decade. Software troubleshooting skills were also considered important. Khan and Ahmed (2013) found that no attention has been given to improve librarians' professional skills and academic qualification in Pakistan. They suggested that advanced training should be given to LIS professionals to cope with the requirements of users in the digital age.

The review of literature revealed a lack of current research on ICT skills considered in this study. So, this study aimed to assess medical librarians' level of information and communication technology expertise based on Medical Library Association (MLA) skill statements, in Iran.

Research questions

This study was the first to investigate the level of ICT skills among medical LIS professionals in Iran based on the MLA's information and communication technology skill statements (2008). The purpose of this study was to seek answers to the following questions:

RQ1. In which areas do Iranian medical librarians possess the highest and lowest level of ICT skills?

RQ2. How is Iranian medical librarians' level of ICT skills compared with the accepted mean?

Method

This study was designed to capture a broad view of technology skills among medical librarians in Iran. The researchers devised a questionnaire, based on a literature review, statements and benchmarks for ICT skills recommended by MLA (Fig.1). The validity of instrument was established by five faculty members with expertise in Information and Communication Technology. The suggestions they made were incorporated into the questionnaire. Internal consistency reliability was measured using Cronbach's Alpha which was found to be 87 percent. The study intended to cover the chief librarians working in medical, dental and pharmacy college libraries affiliated to the Ministry of Health and Medical Education (MOHME), in Iran. A total of 76 questionnaires were distributed through mail, email, and personal visits, of which 65 (85.5 percent) were returned. The level of ICT skills was measured on a five-point Likert scale of Beginner (1), Below Average (2), Average (3), Good (4), and Expert (5). To estimate the librarians' level of information and communication technology skills, a total score for each respondent was calculated on each statement. Namely, every respondent's skill scores on each statement's corresponding items were added together. The obtained scores of individual respondents for each statement were then divided by the number of relevant statement's corresponding items. Finally, an overall mean value of respondents' score on each statement was calculated, which was used to rank the librarians skill score on each statement. The skill scores

(mean scores) less than three were treated as medical librarians lack of skills, equal to three as medium level of skills in ICT and mean values more than three as adequate level of skills. Data analysis was performed using Statistical Package for Social Science (SPSS), version 20, through different statistical techniques such as mean, standard deviation, and one sample t-test.

According to MLA statements in 2008, the questionnaire included competencies in:

Statement 1. Basic principles of automated systems, data standards, and system analysis techniques including design and evaluation

This statement includes the following items: Integrated library management systems, information retrieval systems, bibliographical utilities, technologies used for reference services, Z39.50, RDF (Resource Description Framework), DC (Dublin Core), MARC21 (Machine Readable Cataloging), AACR2 (Anglo American Cataloguing Rules), MESH (Medical Subject Headings), LCSH (Library of Congress Subject Headings), preliminary investigation, problem identification, requirements analysis, decision analysis, and system implementation.
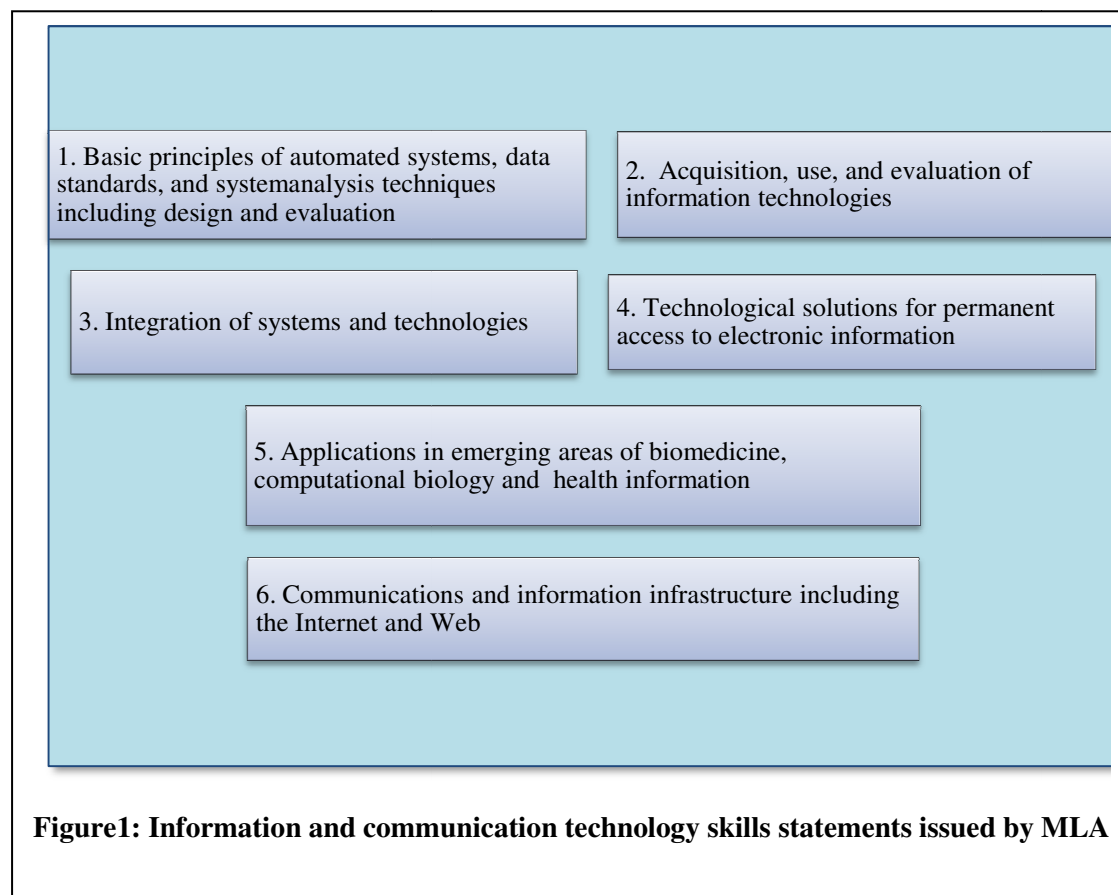
Figure1: Information and communication technology skills statements issued by MLA

Statement 2. Acquisition, use, and evaluation of information technologies

This statement includes the following items: Technical skills in computers, skills in using electronic resources including e-journals, e-books, e-thesis, skills in comparing hardware/software technologies, transaction log analysis, and electronic resource assessment/management systems.

Statement 3. Integration of systems and technologies

Statement 3 includes the following items: Federated/Meta search engines, RFID (Radio Frequency Identification), Wikis, RSS(Really Simple Syndication), blogs, Social Networking Services (SNS), Mashups, Web 3.0 tools (Ontology/Taxonomy, Artificial Intelligence, Metadata Systems),portals, Intranet, VLE (Virtual Learning Environment e.g. Blackboard, WebCT, eCollege, etc.), Learning Objects, Content Management Systems (CMS e.g. Joomla, Durpal), referencing software, digital libraries (e.g. Green Stone, Fedora, Dspace), Optical Character Recognition (OCR), Open-URL Link Resolver, Remote Patron Authentication (RPA), electronic reserve systems, and programming languages.

Statement 4. Technological solutions for permanent access to electronic information

Statement 4 includes one item: Digital archiving and preservation.

Statement 5. Applications in emerging areas of biomedicine, computational biology and health information

Statement 5 includes the following items: Gen Bank, EMBL (European Molecular Biology Laboratory), DNA Data Bank of Japan (DDBJ), SWISS-PROT, PIR (Protein Identification Resource), UMLS (Unified Medical Language System), RxNorm (provides normalized names for clinical drugs), SNOMED CT (Systematized Nomenclature of Medicine-Clinical Terms), DICOM (Digital Imaging And Communication in Medicine), and HL7 (Health Level Seven).

Statement 6.Communications and information infrastructure including the Internet and Web

This statement includes the following items: Internet surfing, conventional search engines, email, TCP/IP (Transmission Control Protocol/Internet Protocol), Operating Systems (UNIX, LINUX, Windows, etc.), WWW, Web browsers, markup languages (HTML,SGML, XML), OPAC/Web

OPAC/OPAC2.0, Video Conferencing , voice over IP (e.g. Skype, Gizmo, etc.), Web page design, Web site administration, PubMed/MEDLINE, Scopus, Web of Science, Cochrane library, ParsMedline (Iranian National Medical Database), IranMedex (Iranian national medical database).

Findings

Personal and professional characteristics of medical librarians

As it is shown in table I, of 65 medical librarians surveyed 38 (58.5 percent) were working in medical colleges, 14 (21.5 percent) in dental colleges and 13 (20 percent) in Pharmacy colleges. Regarding the level of professional education, it is seen that a majority (75.8 percent) of respondents held a master's degree in library and information science. The remaining 20 percent and 4.2 percent held bachelor degree and PhD, respectively. The highest segment of respondents (26.2 percent) had 11-15 years professional experience and the rest of respondents had professional experience as follows, respectively: 6-10 years (24.6 percent), 5 years or less (23 percent), 21 years or more (17 percent) and 16-20 years (9.2 percent).

Table I. Personal and professional characteristics of respondents

Professional education	No.	Percent
PhD in LIS	3	4.2
Master in LIS	49	75.8
Bachelor in LIS	13	20
Subject-wise distribution of libraries		
Medical colleges	38	58.5
Dental colleges	14	21.5
Pharmacy colleges	13	20
Professional experience		
5 Years or less	15	23.0
6 -10 years	16	24.6
11- 15 years	17	26.1
16 - 20 years	6	9.2
21 years or more	11	17

Total	65	100	

Respondents' information and communication technology (ICT) skills

The ranked ICT skills of Iranian medical librarians on each statement based on calculated mean are shown in table II. The librarians were more skillful in items covered under statement 6 (mean=3.36): communications and information infrastructure including the Internet surfing, its protocols, website designing and administration, searching web-based resources, including national (ParsMedline and IranMedex) and international medical databases, this was followed by items covered under statement 2 (mean=3.12): acquisition, use, and evaluation of information technologies which involves technical skills in computers, expertise in using electronic resources including e-journals, e-books, e-thesis, skills in comparing hardware/software technologies, transaction log analysis, electronic resource assessment/management systems.

Moreover, participants' skills score on statement 1 (Basic principles of automated systems, data standards, and system analysis techniques including design and evaluation) was ranked as third (mean=3.11), which includes integrated library management systems, information retrieval systems, bibliographical utilities, technologies used for reference services, data standards and system analysis techniques, and then statement 4 (mean=2.84) (Technological solutions for permanent access to electronic information), which involves skills in digital archiving and preservation. Furthermore, as table II indicates, skills on Integration of systems and technologies (statements 3, mean=2.50) and applications in emerging areas of biomedicine, computational biology and health information (statements 5, mean=2.07) were ranked as fifth and sixth among the librarians.

Table II. The ranked ICT skills of respondents

MLA ICT skill statements	Mean±SD	Minimum	Maximum	Rank
Communications and information infrastructure including the Internet and Web (S_6)	3.36±.85	1.26	4.68	1
Acquisition, use, and evaluation of information technologies (S_2)	3.12±.56	1.80	4.60	2
Basic principles of automated systems, data standards, and system analysis	3.11±.69	1.65	4.47	3

techniques including design and evaluation (S$_1$)				
Technological solutions for permanent access to electronic information (S$_4$)	2.84±.97	1	5	4
Integration of systems and technologies (S$_3$)	2.50±.81	1	4.04	5
Applications in emerging areas of biomedicine, computational biology and health information (S$_5$)	2.07±.74	1	4.20	6

One-Sample t-test was performed on skill scores of the librarians for each statement to evaluate whether their skill scores were significantly different from the expected mean score (mean=3) for librarians' level of skills. As indicated in table II, the calculated skill score of the librarians for statement 6 (communications and information infrastructure) was significantly higher than the expected mean value. Furthermore, no significant differences were detected between the expected mean value and skill scores on statements 2, 1, and four. Moreover, the librarians' skill scores on statements 3 and 5 were found to be lower than the expected mean value of three. It can be concluded that the librarians had adequate skills on statement 6, and possessed moderate level of skills on statements 2, 1, and four, respectively. Further, The respondents showed to own inadequate expertise on statements 3 and five.

Table III. The comparison of Iranian medical librarians' skills with expected mean

test value = 3					95% Confidence interval of the difference	
MLA ICT skill statements	t	df	Sig. (2-tailed)	Mean difference	Lower	Upper
Basic principles of automated systems, data standards, and system analysis techniques including design and evaluation (S$_1$)	1.36	64	.178	.11	-.05	.28
Acquisition, use, and evaluation of information technologies (S$_2$)	1.84	64	.069	.12	-.01	.26
Integration of systems and technologies (S$_3$)	-4.87	64	.000*	-.49	-.69	-.29
Technological solutions for	-1.27	64	.207	-.15	-.39	.08

permanent access to electronic information (S$_4$)						
Applications in emerging areas of biomedicine, computational biology and health information (S$_5$)	-9.95	64	.000*	-.92	-1.10	-.73
Communications and information infrastructure including the Internet and Web (S$_6$)	3.45	64	.001*	.36	.15	.57
*= Significance						

The mentioned results have been summarized in table IV. As it is clear from this table, the librarians rated their skills in communications and information infrastructure including the Internet and Web (statement 6) as adequate, a medium level of skills in statement 1 (Basic principles of automated systems, data standards, and system analysis techniques including design and evaluation), statement 2 (Acquisition, use, and evaluation of information technologies) and statement 4 (Technological solutions for permanent access to electronic information).

Moreover, the respondents stated undesirable level of skills in statements 3 (Integration of systems and technologies) and statement five (Applications in emerging areas of biomedicine,

Table IV. A summary of librarians' level of ICT skills

Statements	Level of ICT skills		
	Adequate skill (Mean>3)	Medium skills (Mean=3)	Inadequate skill (Mean<3)
Basic principles of automated systems, data standards, and system analysis techniques including design and evaluation (S$_1$)		✓	
Acquisition, use, and evaluation of information technologies (S$_2$)		✓	
Integration of systems and technologies (S$_3$)			✓
Technological solutions for permanent access to electronic information (S$_4$)		✓	
Applications in emerging areas of biomedicine, computational biology and health information (S$_5$)			✓
Communications and information	✓		

infrastructure including the Internet and Web (S_6)			

Discussion

This was a pioneering study seeking to provide an overview of the current status of medical LIS professionals' level of ICT skills reporting on six skill statements published by MLA. This study indicated that chief librarians working in medical, dental and pharmacy colleges were more skillful in communications and information infrastructure including the Internet and Web (statement 6) which is consisted of Internet surfing, conventional search engines, Email, etc. This may be due to the fact that LIS professionals usually use Internet and Web to perform and support some of everyday library operations including cataloging, lending, and the prevalence of e-resources such as e-books, e-journals, and the like, so they were more conversant with items covered in statement 6. However, the medical librarians were less skillful in items covered under statement 5, applications in emerging areas of biomedicine, computational biology and health information, which involves GenBank, EMBL, DNA Data Bank of Japan, SWISS-PROT, PIR, UMLS, RxNorm, SNOMED CT, DICOM, and HL7). It may be due to the fact that they are in English language and thus acts as a drawback for Persians. Whereas, medical librarians must be familiar with the websites, standard medical languages and medical standards in order to meet the information needs of their users in the new era of digital environment.

Further, data analysis revealed that the medical librarians indicated inadequate familiarity with items under statement 3 (Integration of systems and technologies), including meta search engines, RFID, Wikis, RSS, Blogs, Social Networking Services, Mashups, Web 3.0 tools (Ontology/Taxonomy, artificial intelligence, metadata systems), portals, Intranet, VLE, Learning Objects, Content Management Systems, referencing software, digital libraries, Optical Character Recognition, Open-URL link resolver, RPA, electronic reserve systems, and programming languages. This result was in accordance with the findings of Isfandyari-Moghaddam and Hosseini-Shoar (2011) who found that the level of familiarity with Web tools such as Wikis, RSS, blogs, social networks, etc. among Iranian academic librarians was low.

The increasing proliferation of digital information necessitates librarians' expertise in preserving digital material to ensure continued access to digital information. However, results indicated that

medical librarians had medium skill in digital archiving and preservation (statement 4). This was followed by skills on items in acquisition, use, and evaluation of information technologies (statement 2) which was indicated to be moderate.

Due to the rapid spread of automation in libraries it is expected that medical librarians to be conversant with integrated library management systems, information retrieval systems, bibliographical utilities, technologies used for reference services, standards that support the searching and retrieval of information across networks, and standard metadata schema for describing electronic records, documents and web resources, preliminary investigation, problem identification, requirements analysis, decision analysis, and system implementation (statement 1). However, the medical librarians had medium level of skills in this regard.

Conclusions and recommendations

This study highlighted that medical librarians' ICT skills seemed to be in a low/moderate level in a developing country like Iran. Our hope is that this study extends prior knowledge on the research area in Iran. Nowadays, in the digital environment, a wide range of skills are expected from the medical librarians. These skills range from basic principles of automated systems to Internet and Web. It is noteworthy for library departments and the faculty members to be conversant with required knowledge and skills expected from modern medical librarians and to ensure that they are developing skills that are currently demanded in the field and valued by professional bodies. Further, medical librarians should take responsibility for their own life-long learning to enhance their knowledge and skills on emerging areas of information and communication technology to maintain up-to-date and hence serve library users better. Moreover, managers, and policy makers provide medical librarians with necessary ICT training programs and pay more attention to the areas of their weaknesses especially applications in emerging areas of biomedicine, computational biology and health information; and Integration of systems and technologies. They should also employ medical LIS professionals with adequate ICT knowledge. LIS programs should incorporate more educational technology (ET) programs, as it has been identified as an area of expected growth opportunity for libraries. The Ministry of Health is recommended to appoint selected LIS departments and professional bodies to establish continuing education (CE) centers equipped with software and hardware facilities to support CE

activities. Further studies might examine the extent to which existing LIS courses and programs are already dealing with ICT skills expected from medical librarians in digital era.

References

Ameen, K. (2011), "Changing scenario of librarianship in Pakistan: Managing with the challenges and opportunities", *Library Management,* Vol. 32No.3, pp.171-182.

Babu, R.B. Vinayagamoorthy, P. and Gopalakrishnan, S. (2007), "ICT Skills among Librarians in Engineering Educational Institutions in Tamil Nadu", *DESIDOC Bulletin of Information Technology*, Vol. 27 No. 6, pp. 55-64.

Burke, L. (2002), "The future role of the librarians in the virtual library environment", *The Australian Library Journal*, Vol. 51 No.1, pp.31-45. available at:http://alia.org.au/publishing/alj/51.1/full.text/future.role.html (accessed August 18, 2011).

Chawner, B. and Oliver, G. (2013), "A survey of New Zealand academic reference librarians: Current and future skills and competencies", *Australian Academic & Research Libraries*, Vol. 44 No. 1, pp.29–39. available at: http://dx.doi.org/10.1080/00048623.2013.773865(accessed November28, 2012).

Dastgerdi, A.F. (2009), "Librarians' education in the age of knowledge: Considerations of skills, methods, and tools", *Library Philosophy and Practice (e-journal)*, available at: http://digitalcommons.unl.edu/libphilprac/255 (accessed June 13, 2012).

Farajpahlou, A.H. (2002),"Criteria for the success of automated library systems: Iranian experience (application and test of related scale)", *Library Review*, Vol. 51 No. 2, pp. 364-372.

Gerolimos, M. and Konsta, R. (2008), Librarians' skills and qualifications in a modern informational environment", *Library Management*, Vol. 29 No. 8/9, pp. 691-699.

Huvila, I., Holmberg, K., Kronqvist-Berg, M., Nivakoski, O. and Widén, G. (2013),"What is Librarian 2.0,New competencies or interactive relations? A library professional viewpoint", *Journal of Librarianship and Information Science,* Vol.45 No.3, pp. 198–205.

Isfandyari-Moghaddam, A. and Hosseini-Shoar, M. (2011), "familiarity and useofweb2 tools among Hamedan University librarians", *Journal of Library and Information Science*, Vol.53 No.1, pp.155-181.

Kattimani, S.F. and Naik, R.R. (2013), "Evaluation of librarianship and ICT skills of library and information professionals working in the engineering college libraries in Karnataka, India: a survey", *Program: electronic library and information systems*, Vol. 47 No. 4, pp.345–369.

Khan, A. and Ahmed, S. (2013), "Job Satisfaction among Librarians in the Universities of Khyber Pakhtunkhwa, Pakistan: A Survey", *Library Philosophy and Practice (e-journal)*, available at: http://digitalcommons.unl.edu/libphilprac/906 (accessed August16, 2013).

Medical Library Association, (2008), "Competencies for lifelong learning and professional success: The educational policy statement of the Medical Library Association", available at: http://www.mlanet.org/education/policy/executive_summary.html (accessed August16, 2011).

Mohsenzadeh, F. and Isfandyari-Moghaddam, A. (2009),"Application of information technologies in academic libraries", *The Electronic Library*, Vol. 27 No. 6, pp. 986-998.

Ramzan, M. and Singh, D. (2010), "Factors affecting librarians' attitudes toward IT application in libraries", *The Electronic Library*, Vol. 23 No. 2, pp. 334-344.

Safahieh, H. and Asemi, A. (2010), "Computer literacy skills of librarians: A case study of Isfahan university libraries, Iran", *The Electronic Library*, Vol. 28 No. 1, pp.89-99.

Saunders, L. (2012), Identifying Core Reference Competencies from an Employers' Perspective: Implications for Instruction", *College & Research Libraries*, Vol.73 No.4, pp.390-404. available at: http://crl.acrl.org/content/73/4/390.full.pdf+html (accessed August16, 2013).

Shafique, F. (2007), "Librarianship: How is the future perceived by librarians in Pakistan?", *Library Review*, Vol. 56 No. 9, pp. 811-820.

Tavassoli Farahi, M. and Gandhi, R.T.D. (2011), "IT skills among LIs professionals of medical libraries in India and Iran: A comparative study", *Annals of Library and Information*, Vol. 58, pp. 161-169.

Thomas, V.K., Satpathi, C. and Satpathi, J.N. (2010), "Emerging challenges in academic librarianship and role of library associations in professional updating", *Library Management*, Vol. 31 Nos. 8/9, pp. 594-609.