

Challenges and Opportunities of Multilingual Library Websites: Evidence from a Developing Country

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ABSTRACT: *This study investigates the language barriers on library websites, analyzing data collected from 133 library websites in Pakistan. Despite a significant increase in the number of library websites in Pakistan, the development of multilingual library websites is still in its infancy stages and doesn't cater to the needs of diverse population of its users. The study provides first-hand findings on the multilinguality of library websites in Pakistan with a focus on challenges and opportunities arising from such websites. Implications of research along with future research directions are also discussed.*

Keywords—*Language Barriers, Library Websites, Multilingual Websites, Machine Translation.*

I. INTRODUCTION

Language barriers are natural in human communication. In cross border communication, these barriers not only include dominance of a particular language (e.g. English) but also the increasingly multilingual the Internet [(David Crystal 2001); (Becker 2007)]. Since beginning of the last decade, the multilinguality on the Internet has sharply increased with online content available in hundreds of languages [(Crystal 2006); (Kelsey 2011)]. This increased multilinguality has created new challenges for language barriers. In order to facilitate the multilingual users to effectively navigate, search, filter, and retrieve the multilingual content from the library websites, various stakeholders need to do collective efforts [(Dubois 1979); (Yunker 2002); (Tixier 2005); (Becker 2007); (Diekema 2012)]. Multilingual users face accessibility issues on library websites available only in English. Language barriers are one of the significant problems that users face while searching, accessing, and retrieving multilingual content on the Internet. Research has been carried out to assess the role of the language in creating difficulties for accessing Internet content [(Anna H. Perrault & Vicki L. Gregory 2000); (Sam Berner 2003); (Seilheimer 2004); (Shaoyi He 2009); (Andreas Blume & Oliver Board 2010)]. Researchers have also looked at various language technologies (such as Speech recognition, Speech synthesis, Text categorization, Text Summarization, Text Indexing, and Text Retrieval) to assess their impact on developing and maintaining multilingual websites [(Hans Uszkoreit 2001); (NLP4DL 2009 et al. 2011); (Lloret 2012)]. Using 133 Pakistani government and private sector library websites, this study investigates various issues of language barriers on library websites with focus on various challenges and opportunities of multilingual library websites in Pakistan.

The study is divided into eight sections. Following the first section on introduction, the second section on literature review begins with a discussion of language barriers concerning multilinguality of the Internet. It then discusses the need of multilingual websites by diverse population and the challenges and opportunities for library websites to meet such needs. The section on research methodology describes the data collection and analysis methodology. The section four provides research questions to be investigated. Section five provides results and its discussion. Section six provides conclusion of the study. Section seven discusses research implications. Following research implications, section eight provides areas of further research.

II. LITERATURE REVIEW

On websites, language barriers can create different problems for effective communication. The first problem is the differences in alphabets, grammatical rules, syntactical rules, and display among various languages (Microsoft MSDN 2007). The second problem is the differences in meaning of various idioms and expressions when they are translated into other languages. Many languages (e.g. Chinese and French) also have many regional variants (Ashmita Goswami 2003).

Demand for multilingual websites is increasing. Many large multinational companies (e.g. Microsoft and IBM), Fortune 100, and Fortune 500 companies have developed their multilingual websites to cater for their worldwide users who differ in language spoken, culture, and common business practices (thebigworld.com 2006). Many governments (e.g. China and Canada) have developed their websites in both English and native language to facilitate their users. Research suggests that a vast majority of people prefer websites in the native language (Julian Perkin 2001) and enormous amount of online content is being continually added in languages other than English [(Garry White 2002); (Li & Yang 2006); (Khosla & Acharya 2012)]. Some prior studies didn't find any positive relationship between language and perceived website usability (Pitis & Vlosky 2000). However latest research suggests a positive relationship between language and perceived website usability [(He 2001); (Hillier 2002); (Hillier 2003); (Nantel & Glaser 2008)].

A digital library (DL) organizes, maintains, and makes available online collection of digital or digitized material accessible through the Web (Lesk, 2004). Multilingual digital libraries (MDLs) either provide multilingual content or multilingual query access to monolingual content. The content can include medical information, literature, economic research, children's literature, newspaper clippings, images, etc. (Lu et al., 2008, Zhou et al., 2006, Geleijnse and Williams, 2007, Hutchinson et al., 2005, Dudas, 2002, Calvanese et al., 2002, Tsang, 1997, Chias and Abad, 2009, Smits and Friis-Christensen, 2007, Clough and Sanderson, 2006, Urs et al., 2002, Francesconi and Peruginelli, 2004, Sheridan et al., 1997).

Multilingual accessibility to library content significantly facilitates multilingual users to meet their needs. With increasing number of Internet users around the globe, the Internet has become a major repository of information for almost everyone. The number of Internet users in other languages is also increasing (Khosla & Acharya 2012). In 2007, 9 out of 25 winners of Noble Prize wrote their masterpieces in languages other than English (Meneghini & Packer 2007). Multinational companies and political entities also take a particular interest in providing multilingual, cross-cultural content (Diekema 2012). Nevertheless, a majority of countries with significant population of non-English speaking citizens still doesn't have multilingual content accessibility on their websites (Downey & Jones 2012). Multilingual library websites are important for libraries and their patrons because of these websites' strategic role in enhancing the quality and effectiveness of various online content and services provided by the libraries (Budzise-Weaver et al. 2012).

Many studies have been conducted on the multilinguality of the library websites. Using a survey of Australian public library websites, (Hildebrand 2003) found a significant shortage of multilingual content on these library websites. Studying 18 Latvian public library websites, (MINERVAPLUS 2006) found that only 17% of the library websites were bilingual (in Latvian and English). Analyzing 52 library websites in Pakistan, (Qutab & Mahmood 2009) found that none of the library's studies provided multilingual content. It can be seen that multilinguality of library websites is an emerging issue. While many studies have been conducted on the subject, the room for further investigation exists especially in the context of developing countries such as Pakistan. To meet the challenges and opportunities of these multilingual library websites, this study will analyze the multilinguality of Pakistani population and then determine the need of multilingual websites by the diverse population of each province/administrative unit and how these needs can be met by these library websites.

Digital Library websites can be created for a variety of reasons. These reasons may include providing quick and easy global-level access to a wide range of cross-boundaries information and ideas (Yang et al., 2008, Maeda et al., 1998, Alessio, 2010), preserving cultural heritage and advance agriculture (Jain and Gorla, 2006, Nicholas et al., 2005), and increased collaboration and understanding among nations (Fox and Marchionini, 1998, Cousins, 2006). Users of multilingual digital libraries are diverse and range from children to citizens, to economists (Bilal and Bachir, 2007, Geleijnse and Williams, 2007, Chias and Abad, 2009).

We see a large number of fully operational multilingual digital libraries across the globe. However, building such libraries requires intensive collaboration often on the international level such as among different agencies, foundations, libraries and software companies (Cousins et al., 2008, Gorman and Tran, 2002, Wooldridge et al., 2009, Calvanese et al., 2002). Such collaboration is essential because building a digital library requires interdisciplinary skills in multiple areas ranging from computer science and arts to natural language processing. Significant literature is available on Europe-based multilingual digital libraries. The European CACAO Project (cross-language access to catalogues and online libraries) provides an infrastructure with built-in cross-language information retrieval techniques that allows retrieval of content in one European language into another European

Table 1: Participating Library Websites

language (Levergood et al., 2008, Alessio, 2010, Bosca and Dini, 2009). Significant work has also been done to develop relevant technologies for multilingual digital libraries. DELOS Network of Excellence, LAURIN, MultiMatch, and Rastko are Europe-based projects conducting research on multilingual digital libraries (Braschler and Ferro, 2007, Ioannidis et al., 2008, Calvanese et al., 2002, Calvanese et al., 2001, Amato et al., 2007, Amato et al., 2008, Dudas, 2002).

To provide their intended functionality, a digital library needs to match the needed information (query) to content in disparate languages. Most common problems associated with crossing the language barrier are problems with translation resources. One of the most common approaches to cross the language barriers on multilingual digital libraries is to use query translation. Using cross-language information retrieval (CLIR), a user can retrieve relevant documents in one or more target languages (such as Arabic and Chinese) using a source query language (such as English). The retrieved documents can then be translated into source language (Peters and Sheridan, 2001, Oard and Diekema, 1998). According to (Yang and Li, 2004), CLIR can be used to access content in another language in many ways. For example, by translating a) the query into the language of the document, b) the documents into the language of the query, c) both query and document into some interlingual representation. Another technique, especially suitable for content that only have item level descriptions or metadata, is to translate the metadata record rather than translating the whole document (Van Oudenaren, 2010, Lee et al., 2003, Francesconi and Peruginelli, 2004). In another technique, provided that language scripts are the same, only words shared between languages (i.e. cognates) can be matched. Multilingual information access (MLIA) is a broader term that includes CLIR. MLIA refers to access (not just retrieval), summarization, and question-answering of information across languages (Gey et al., 2006).

Many other techniques have been developed to cross the language barriers. For example, a multi-language information retrieval model with a multilingual dictionary (Clinchant and Renders, 2009), content access using a knowledge organization systems (KOSs) (Hodge, 2000), a computer supported indexing method to create a multilingual thesaurus (Becker, 2000, Schiel et al., 1999), a fully automatic multilingual thesaurus (Yang et al., 2008), a Chinese translation of the MeSH (Medical Subject Headings) to facilitate access to medical websites for Chinese language users (Lu et al., 2008), a similarity thesaurus drawn from a parallel corpus in the legal domain (Sheridan et al., 1997), Mixed translation methodologies based on multilingual glossary and an ontology (Monroy et al., 2010), and a system that provides federated search capabilities across multiple digital libraries in different languages (Brisaboa et al. 2002).

III. RESEARCH METHODOLOGY

3.1 Data Collection and Analysis

This study used two directory listings of Pakistani library websites [(Qutab & Mahmood 2009); (Comsats 2010)]. In addition, a list of universities/degree awarding institutions was obtained from Higher Education Commission Pakistan (Higher Education Commission, Pakistan 2012). A simple web search was performed to locate the library websites of each university/degree awarding institution in the list. Another web search was performed to locate the library websites of any other government or private institutions other than universities/degree awarding institutions. A total of 133 library websites was found. See TABLE 1 for a list of participating library websites and their web addresses.

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No.	University/Institution Name	Library Web Address	Institution Type
1	Abasyn University, Peshawar	http://www.abasynuniv.edu.pk/library.html	University/Degree Awarding Institution
2	Abdul Wali Khan University, Mardan	http://www.awkum.edu.pk/Administration/Library.html	University/Degree Awarding Institution
3	Air University Islamabad	http://www.au.edu.pk/research_library.htm	University/Degree Awarding Institution
4	Aitchison College Lahore	http://www.aitchison.edu.pk/index.pl/library2	University/Degree Awarding Institution
5	AllamaIqbal Urdu Cyber Library	http://www.iqbalcyberlibrary.net/	University/Degree Awarding Institution
6	Army Medical College, Islamabad	http://www.nust.edu.pk/Campuses/AMC/AMC-Library.aspx/	University/Degree Awarding Institution
7	BahauddinZakariya University, Multan	http://www.bzu.edu.pk/library.asp	University/Degree Awarding Institution
8	Bahria University, Islamabad	http://www.bci.edu.pk/dlibrary.aspx#	University/Degree Awarding Institution
9	Balochistan University of Engineering and Technology, Khuzdar	http://buetk.edu.pk/library.html	University/Degree Awarding Institution
10	Balochistan University of Information Technology and Management Sciences, Quetta	http://www.buitms.edu.pk/Library/Default.aspx	University/Degree Awarding Institution
11	Beacon House University, Lahore	http://www.bnu.edu.pk/index.php?option=com_content&view=article&id=165&Itemid=284	University/Degree Awarding Institution
12	Bolan University of Medical & Health Sciences, Quetta	http://172.168.0.30/gsd/cgi-bin/library	University/Degree Awarding Institution
13	CECOS University of Information Technology and Emerging Sciences	http://www.cecos.edu.pk/facilities.html	University/Degree Awarding Institution
14	College of Aeronautical Engineering, Islamabad	http://www.nust.edu.pk/Campuses/CAE/CAE-Library.aspx	University/Degree Awarding Institution
15	College of Electrical and Mechanical Engineering, Quetta	http://www.ceme.edu.pk/services/library.html	University/Degree Awarding Institution
16	COMSATS Institute of Information Technology	http://www.ciit.edu.pk/Library/	University/Degree Awarding Institution
17	Dawood College of Engineering & Technology, Karachi	http://www.dcet.edu.pk/existing-students.html	University/Degree Awarding Institution
18	DHA Suffa University, Karachi	http://www.dsu.edu.pk/library.php	University/Degree Awarding Institution
19	Fatima Jinnah Womens University, Rawalpindi	http://www.fjwu.edu.pk/facilities/Library.htm	University/Degree Awarding Institution
20	FC College University, Lahore	http://fccollege.edu.pk/officesandservices_ewinglibrary.php	University/Degree Awarding Institution
21	Federal Urdu University of Arts, Science & Technology, Karachi	http://www.fuuastisb.edu.pk/index.php?option=com_wrapper&view=wrapper&Itemid=240	University/Degree Awarding Institution
22	Forman Christian College	http://www.fccollege.edu.pk/academics/library	University/Degree Awarding Institution
23	Foundation University, Islamabad	http://digitallibrary.fui.edu.pk/SitePages/home_2.aspx	University/Degree Awarding Institution
24	Frontier Women University, Peshawar	http://www.fwu.edu.pk/general.php?goto=facilities&ka=15	University/Degree Awarding Institution
25	GhulamIshaq Khan Institute of Science and Technology, NWFP	http://www.giki.edu.pk/library/index.htm	University/Degree Awarding Institution

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26	GIFT University, Gujranwala	http://www.gift.edu.pk/quick_links/online_library.php	University/Degree Awarding Institution
27	Goethe Institute, Karachi	http://www.goethe.de/ins/pk/kar/wis/bib/enindex.htm	University/Degree Awarding Institution
28	Gomal University	http://www.gu.edu.pk/home_data/facilities/library.asp	University/Degree Awarding Institution
29	Government College University, Faisalabad	http://gcuf.edu.pk/administration/71-2/	University/Degree Awarding Institution
30	Government College University, Lahore	http://www.gcu.edu.pk/library/Index.htm	University/Degree Awarding Institution
31	Government College, Faisalabad	http://www.gcuf.edu.pk/library.php	University/Degree Awarding Institution
32	Greenwich University, Karachi	http://www.greenwichuniversity.edu.pk/lib.html	University/Degree Awarding Institution
33	Hajvery University, Lahore	http://www.hajveryuniversity.com/libraries.asp	University/Degree Awarding Institution
34	Hajvery University, Multan	http://hup.edu.pk/libraries-home.html	University/Degree Awarding Institution
35	Hamdard University, Karachi	http://www.hamdard.edu.pk/resources.php	University/Degree Awarding Institution
36	Hazara University, Dodhial, Mansehra	http://www.hu.edu.pk/lib.php	University/Degree Awarding Institution
37	HITEC University, Taxila	http://www.hitecuni.edu.pk/default/index.php?option=com_content&view=article&id=66&Itemid=72	University/Degree Awarding Institution
38	Imperial College of Business Studies, Lahore	http://www.imperial.edu.pk/current-students/library-digital-library-110.html	University/Degree Awarding Institution
39	Indus University, Karachi	http://www.indus.edu.pk/website/campfacility.php	University/Degree Awarding Institution
40	Indus Valley School of Art and Architecture, Karachi	http://www.indusvalley.edu.pk/library.html	University/Degree Awarding Institution
41	Institute for Space Technology	http://www.ist.edu.pk/library.html	University/Degree Awarding Institution
42	Institute of Business Administration, Karachi	http://www.iba.edu.pk/IBALibraries/	University/Degree Awarding Institution
43	Institute of Business Management, Karachi	http://www.iobm.edu.pk/library.html	University/Degree Awarding Institution
44	Institute of Management Sciences (IMSciences), Peshawar	http://library.imsciences.edu.pk/	University/Degree Awarding Institution
45	Institute of Management Sciences, Lahore	http://library.imsciences.edu.pk/	University/Degree Awarding Institution
46	Institute of regional studies, Islamabad	http://irs.org.pk/ResoLibrary.htm	University/Degree Awarding Institution
47	International Islamic University, Islamabad	http://my.iiu.edu.pk/Libraries/CentralLibrary/tabid/266/Default.aspx	University/Degree Awarding Institution
48	IQRA University (Islamabad)	http://www.iqraisb.edu.pk/Library%20web%20portal/libraryportal.htm	University/Degree Awarding Institution
49	IQRA University (Karachi)	http://www.iqra.edu.pk/infoRC.asp	University/Degree Awarding Institution
50	IQRA University (Quetta)	http://www.iqraqta.edu.pk/library.shtml	University/Degree Awarding Institution
51	Islamia College University, Peshawar	http://www.icp.edu.pk/central-library.html	University/Degree Awarding Institution

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52	Islamia University, Bahawalpur	http://www.iub.edu.pk/dil.php	University/Degree Awarding Institution
53	Jinnah University for Women, Karachi	http://www.juw.edu.pk/others/facilities.htm	University/Degree Awarding Institution
54	Karachi Institute of Economics & Technology	http://www.pafkiet.edu.pk/Default.aspx?tabid=180	University/Degree Awarding Institution
55	Khadim Ali Shah Bukhari Institute of Technology	http://library.kasbit.edu.pk/	University/Degree Awarding Institution
56	Khyber Medical College, Peshawar	http://www.kmc.edu.pk/library.htm	University/Degree Awarding Institution
57	King Edward Medical University, Lahore	http://www.kemu.edu.pk/library.html	University/Degree Awarding Institution
58	Kinnaird College for Women	http://kinnairdlibrary.weebly.com/	University/Degree Awarding Institution
59	Kitaabghar	http://www.kitaabghar.com/	Independent Organization
60	Kohat University of Science & Technology	http://www.kust.edu.pk/index.php?option=com_content&view=article&id=225&Itemid=222	University/Degree Awarding Institution
61	Kohat University of Science and Technology, Kohat	http://www.kust.edu.pk/index.php/central-library	University/Degree Awarding Institution
62	Lahore Chamber of Commerce and Industry	http://lcci.com.pk/library.html	University/Degree Awarding Institution
63	Lahore College for Women University, Lahore	http://www.lcwu.edu.pk/library-introduction.html	University/Degree Awarding Institution
64	Lahore School of Economics	http://www.lahoreschoolofeconomics.edu.pk/library12.html	University/Degree Awarding Institution
65	Lahore University of Management Science	http://library.lums.edu.pk/	University/Degree Awarding Institution
66	Lasbela University of Agriculture, Water & Marine Science, Lasbela	http://www.luawms.edu.pk/library.php	University/Degree Awarding Institution
67	Liaquat University of Medical and Health Sciences	http://www.lumhs.edu.pk/administration/library/index.html	University/Degree Awarding Institution
68	Mehran University of Eng. & Technology	http://www.muets.edu.pk/academics/library	University/Degree Awarding Institution
69	Military College of Engineering, Islamabad	http://mce.nust.edu.pk/index.php?option=com_content&view=article&id=51&Itemid=11	University/Degree Awarding Institution
70	Military College of Signals	http://mcs.nust.edu.pk/LabsAndLibraries.aspx	University/Degree Awarding Institution
71	Minhaj University, Lahore	https://sites.google.com/site/wwwsargodhalibraries/minhaj-university-lahore	University/Degree Awarding Institution
72	Mohammad Ali Jinnah University	http://www.jinnah.edu.pk/profile/facilities.php	University/Degree Awarding Institution
73	Mohi-ud-Din Islamic University, Islamabad	http://www.miu.edu.pk/lib.htm	University/Degree Awarding Institution
74	Mohi-ud-Din Islamic University, Nerian Sharif, AJ&K	http://www.miu.edu.pk/lib.htm	University/Degree Awarding Institution
75	National College of Arts, Lahore	http://www.nca.edu.pk/library.htm	University/Degree Awarding Institution
76	National Defence University, Islamabad	http://111.68.99.107/libmax/opac/index.aspx	University/Degree Awarding Institution
77	National Language Authority	http://www.nla.gov.pk/beta/library/	University/Degree

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			Awarding Institution
78	National Library of Pakistan	http://www.nlp.gov.pk/Index.htm	Government Organization
79	National School of Public Policy	http://www.nspp.gov.pk/library_nm.w.html	University/Degree Awarding Institution
80	National Textile University, Faisalabad	http://www.ntu.edu.pk/library/	University/Degree Awarding Institution
81	National University of Modern Languages, Islamabad	http://www.numl.edu.pk/numl-library.aspx	University/Degree Awarding Institution
82	NazeerHussain University	http://www.nhu.edu.pk/htms/facilities.html	University/Degree Awarding Institution
83	NED University of Engineering and Technology, Karachi	http://www.neduet.edu.pk/library/index.html	University/Degree Awarding Institution
84	Newports Institute of Communications and Economics	http://www.newports.edu.pk/academic-facilities.aspx	University/Degree Awarding Institution
85	NGO resource center, Karachi	http://www.ngorc.org.pk/html/irc.htm20	Independent Organization
86	NUST (National University of Science and Technology)	http://nust.edu.pk/usr/search.aspx	University/Degree Awarding Institution
87	NUST Business School, Islamabad	http://nbs.nust.edu.pk/Elibrary/business%20portel/mainpage_lib.html	University/Degree Awarding Institution
88	NUST School of Electrical Engineering and Computer Science (NUST-SEECs)	http://nseecs.edu.pk/library/index.php	University/Degree Awarding Institution
89	NWFP Agriculture University, Peshawar	http://www.aup.edu.pk/library.php	University/Degree Awarding Institution
90	NWFP University of Engineering & Technology	http://www.nwfpuet.edu.pk/services.htm#CentralLib	University/Degree Awarding Institution
91	Pakistan Digital Library	http://www.pakistan.web.pk/categories/pakistan-digital-library-urdu-english-books.120/#axzz1zRRoEmsU	Independent Organization
92	Pakistan Institute of Development Economics, Islamabad	http://pide.org.pk/index.php?option=com_content&task=view&id=175&Itemid=98	University/Degree Awarding Institution
93	PIEAS, Islamabad	http://www.pieas.edu.pk/facilities/library.php	University/Degree Awarding Institution
94	Punjab Public Library, Lahore	http://www.ppl.org.pk/	University/Degree Awarding Institution
95	Quaid-e-Awam University of Engineering, Science & Technology	http://www.quest.edu.pk/facilities/facility.html	University/Degree Awarding Institution
96	Quaid-e-Azam University, Islamabad	http://www.qau.edu.pk/lib/	University/Degree Awarding Institution
97	Riphah International University, Islamabad	http://www.riphah.edu.pk/detail_page.aspx?pid=161	University/Degree Awarding Institution
98	SardarBahadur Khan Womens University, Baluchistan	http://www.sbkwu.edu.pk/sbkwu_new/library/	University/Degree Awarding Institution
99	Sarhad University of Science and Information Technology, Peshawar	http://www.digitallibrary.edu.pk/sarhaditunipesh.html	University/Degree Awarding Institution
100	School of Chemical & Material Engineering (SCME)	http://scme.nust.edu.pk/library.php	University/Degree Awarding Institution
101	School of Civil & Environmental Engineering (SCEE)	http://libraryscee.weebly.com/	University/Degree Awarding Institution
102	School of Electrical Engineering and Computer Science(SEECS)	http://seecs.nust.edu.pk/library/index.php	University/Degree Awarding Institution

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103	ShaheedZulfikar Ali Bhutto Institute of Science & Technology (SZABIST)	http://zablis.szabist.edu.pk/AboutLibrary.aspx?Options=OpenForm	University/Degree Awarding Institution
104	Sindh Agriculture University	http://www.sau.edu.pk/cenlib.html	University/Degree Awarding Institution
105	Sindh Agriculture University, Tandojam	http://www.sau.edu.pk/dlib.html	University/Degree Awarding Institution
106	Sindhi Adabi Board online Library	http://www.sindhiadabiboard.org	Government Organization
107	Sir Sayed University of Engineering and Technology, Karachi	http://www.ssuet.edu.pk/Library.htm	University/Degree Awarding Institution
108	State Bank of Pakistan	http://www.sbp.org.pk/library/index.htm	University/Degree Awarding Institution
109	Sukkur Institute of Business Administration	http://site.ebrary.com/lib/ibasukkur/home.action	University/Degree Awarding Institution
110	Superior Group of Colleges	http://www.superior.edu.pk/dlibrary.html	University/Degree Awarding Institution
111	Textile Institute of Pakistan	http://www.tip.edu.pk/campus-facilities/library-resource-center.html	University/Degree Awarding Institution
112	The Agha Khan University, Karachi	http://www.aku.edu/AKULibrary/index.shtml	University/Degree Awarding Institution
113	United Nations Common Library, Lahore	http://www.un.org.pk/library/index.htm	Independent Organization
114	University of Agriculture, Faisalabad	http://www.uaf.edu.pk/new_site/library/lib_overview.html	University/Degree Awarding Institution
115	University of Azad Jammu and Kashmir, Muzafarabad	http://www.ajku.edu.pk/CentralLib.php	University/Degree Awarding Institution
116	University of Baluchistan	http://www.uob.edu.pk/digitallibrary/index.htm	University/Degree Awarding Institution
117	University of Central Punjab	http://library.ucp.edu.pk/	University/Degree Awarding Institution
118	University of Engineering and Technology, Texlia	http://digitallibrary.uettaxila.edu.pk/	University/Degree Awarding Institution
119	University of Gujarat, Gujarat	http://www.digitallibrary.edu.pk/uni_of_gujrat.html	University/Degree Awarding Institution
120	University of Health Sciences, Lahore	http://www.uhs.edu.pk/library.html	University/Degree Awarding Institution
121	University of Karachi	http://www.uok.edu.pk/library/index.php	University/Degree Awarding Institution
122	University of Malakand, Malakand	http://www.uom.edu.pk/digitallibrary.php	University/Degree Awarding Institution
123	University of Management and Technology	http://library.umat.edu.pk/	University/Degree Awarding Institution
124	University of Peshawar, Peshawar	http://www.digitallibrary.edu.pk/peshuni.html	University/Degree Awarding Institution
125	University of Sargodha	http://www.uos.edu.pk/uploads/library.aspx	University/Degree Awarding Institution
126	University of Science & Technology Bannu	http://www.ustb.edu.pk/index.php/library/94-digital-library	University/Degree Awarding Institution
127	University of Sindh	http://library.usindh.edu.pk/	University/Degree Awarding Institution
128	University of South Asia, Lahore	http://www.usa.edu.pk/HECVirtualLibrary.aspx?pid=HECVirtualLibrary	University/Degree Awarding Institution
129	University of the Punjab, Lahore	http://www.pulibrary.edu.pk/	University/Degree Awarding Institution

130	University of Veterinary and Animal Sciences, Lahore	http://www.uvas.edu.pk/library/about/about.asp	University/Degree Awarding Institution
131	University of Wah, WahCantt.	http://www.uow.edu.pk/lib/lib/lib.php	University/Degree Awarding Institution
132	Virtual University of Pakistan, Lahore	http://library.vu.edu.pk	University/Degree Awarding Institution
133	Ziauddin University, Karachi	http://www.zu.edu.pk/Learning_Resource_Centre.html	University/Degree Awarding Institution

See TABLE 2 for the breakdown of the library websites.

Table 2: Total Library Websites

Total Library Websites	133
Total Multilingual Library Websites	2
Total University Library Websites	127
Total Institutions Library Websites	6

Each library website was visited to determine the availability of languages and translation services. Using Census Pakistan data (Census Pakistan 2012), the multilingual population of each province/administrative unit and major ethnic groups were determined (See TABLE 3).

Table 3: Ethnic Groups And Languages Spoken In Various Regions

Administrative Unit	Urdu	Punjabi	Sindhi	Pushto	Balochi	Saraiki	Others
Punjab	4.51%	75.23%	0.13%	1.16%	0.66%	17.36%	0.95%
Sindh	21.05%	6.99%	59.73%	4.19%	2.11%	1.00%	4.93%
Balochistan	0.97%	2.52%	5.58%	29.64%	54.76%	2.42%	4.11%
Khyber Pakhtoonkhwa	0.78%	0.97%	0.04%	73.90%	0.01%	3.86%	20.43%
Azad Jammu and Kashmir	Punjabi is most spoken followed by Pahari and Mirpuri *						
	* Estimated						

Two common methods can be used to provide multilingual access on websites. In first method, the content on the library website can be provided in multiple languages. In second method, the library website can use online machine translation tools to translate the content in one language to other languages.

In this study, two surveys were conducted. One survey was conducted among the potential users of the digital library websites. The second survey was conducted with the digital library administrators of various universities in Karachi.

The study used a convenience sample limited to a desired population to obtain data. In research, it is sometimes difficult or even impossible to select a random or systematic nonrandom sample. In such case, (Fraenkel&Wallen 2005) acknowledge that researchers may be forced to use a convenience sample to obtain data. Members of the accessible population were 400 undergrad/graduate students and working graduates of various fields of study (Business administration, Engineering, IT, Computer Science) and 10 administrators of digital libraries from various public/private universities in Karachi.

IV. RESEARCH QUESTIONS

The data collected was analyzed to provide an answer to the following questions.

- a) How many government library websites are multilingual (i.e. content in more than one language) and how many languages are used there?

- b) How many private library websites are multilingual and how many languages are used there?
- c) How the government and private library websites cater to the needs of their multilingual users?
- d) How the multilingual content is provided i.e. either through content available in different languages or through machine translation?
- e) What is the current state of use and development of multilingual digital libraries and some possible reasons behind it?

V. RESULTS AND DISCUSSION

Out of 133 library websites analyzed only 2 (1.5 %) were bilingual (See TABLE 2). A highly significant majority (127 or 95.5%) were university/degree awarding institutions library websites in which the significant majority was of government library websites (74 or 55.6%) (See TABLE 4).

Table 4: Multilinguality Of Government Library Websites

Government Library Websites	74 (55.6%)
Government University Library Websites	72 (56.7%)
Government Institutions Library Websites	2 (33.3%)
Government University Library Websites (Multilingual)	0 (0.0%)
Government Institutions Library Websites (Multilingual)	1 (50.0%)
Government Library Websites (Non-Multilingual)	72 (97.3%)
Government Institutions Library Websites (Non-Multilingual)	1 (50.0%)

The pattern was reversed in case of institutional library websites where private institution's library websites dominated (4 or 66.6 %) (See TABLE 5).

Table 5: Multilinguality Of Private Library Websites

Private Library Websites	58 (43.6%)
Private University Library Websites	54 (42.5%)
Private Institutions Library Websites	4 (66.7%)
Private University Library Websites (Multilingual)	0 (0 %)
Private Institutions Library Websites (Multilingual)	1 (25.0%)
Private Library Websites (Non-Multilingual)	54 (93.1%)
Private Institutions Library Websites (Non-Multilingual)	3 (75.0%)

None of the government or private or private university library website was multilingual. None of the library websites offered content translation services. 75% of the library websites were located in five major metropolis of Pakistan, and none was located in rural areas (See TABLE 6).

Table 6: Library Websites Distribution

Top 5 Cities with Most Library Website	
City	Number of Library Websites
Lahore	31
Islamabad	26
Karachi	25
Peshawar	12
Quetta	6

Out of 133 library websites visited, the languages available didn't meet the needs of the ethnic groups of the province/administrative unit where the library was located. The language diversity of the population in the

provinces was not reflected in the content of the library websites (i.e. content was only available in English or bilingual) (See TABLE 7).

Table 7: Library Websites In Various Provinces/Administrative Units And Languages Used

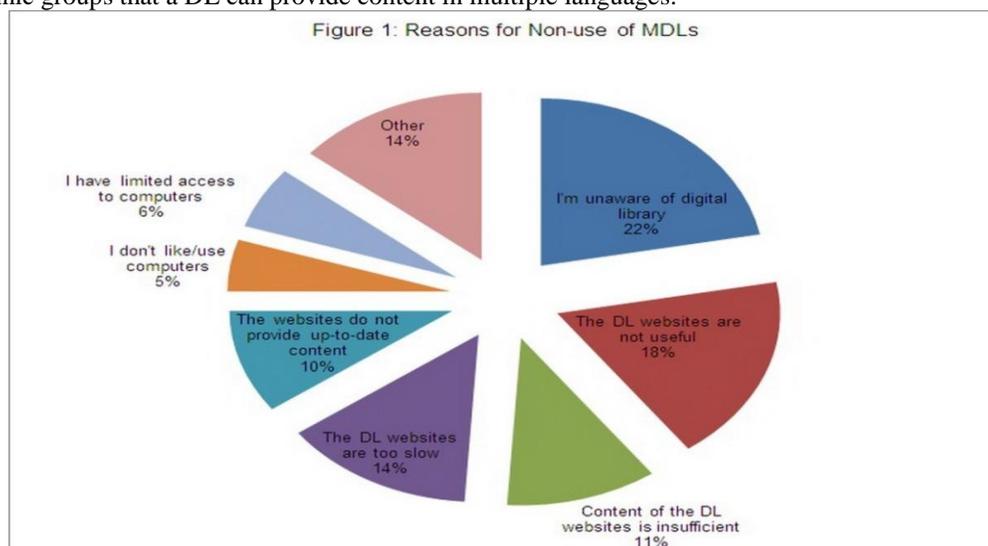
Administrative Unit	Number of Library Websites	Languages used on Library Websites	Top 3 Ethnic Groups
Punjab	72	English	Punjabi, Saraiki, Urdu
Sindh	33	English, Sindhi	Sindhi, Urdu, Punjabi
Balochistan	7	English	Balochi, Pushto, Sindhi
Khyber Pakhtoonkhwa	19	English	Pushto, Saraiki, Others
Azad Jammu and Kashmir	2	English	Punjabi, Pahari, Mirpuri

None of the library websites provided content in more than two languages. Only two websites provided bilingual content (See TABLE 8).

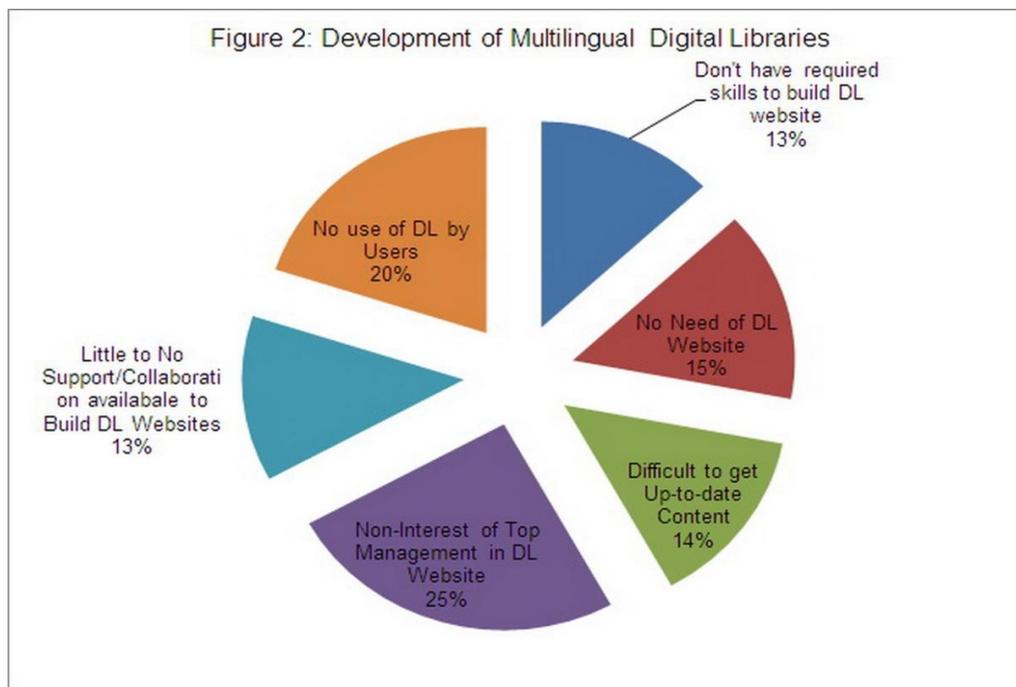
Table 8: Multilinguality Of Library Websites

Number of Languages Used	Languages
3	English, Urdu, Sindhi

The survey conducted with the potential users of digital libraries revealed that only 20% used the MDLs while the remaining 80% either never used them or abandoned using MDLs. The survey of non-users of MDLs revealed that 22% were unaware of the existence of MDLs. Only 18% found MDLs useful. While a wide majority of DL users had access to computers, the sufficiency/updating of MDLs content and the slow speed of MDLs websites appeared to encourage the non-use of MDLs. Another interesting finding is that while DLs in Pakistan clearly lacked the availability and accessibility of multilingual content, only 11% of non-users considered the content of DL websites insufficient and 18% non-useful. Given the ethnic diversity in Pakistan, one probable explanation of this could either be the dominant use of English in educational institutions of Pakistan or unawareness of users of various ethnic groups that a DL can provide content in multiple languages.



The survey conducted with the MDLs administrators revealed that non-interest of top management was one of the most significant barriers behind the non-development of MDL websites. While a significant majority of MDL administrators believed that MDL websites are needed, the non-use of MDLs by users, difficulty in getting up-to-date content, coupled with the lack of required skills and support/collaboration to build MDL websites also hindered the development of MDLs.



The current language barriers, while making it difficult for multilingual users to meet their information needs, have also brought challenges and opportunities to provide multilingual access to library websites. The findings are consistent with previous research (Qutab & Mahmood 2009). After 3 years, we see an increase in library websites from 52 in 2009 to 133 in 2012 (155 % increase). However, no notable improvement with respect to multilingual content availability and accessibility on library websites has been observed.

One possible explanation of this phenomenon could be the government priorities, deteriorating country indicators, and brain drain. Pakistan is the country most hardly hit by brain drain (Human capital flight) and around 36,000 professionals (including doctors, engineers and teachers, migrated during last 30 years (DailyTimes.com.pk 2009). From 2009 to 2011, government prioritization of ICT dropped from 38th to 74th. Quality of the education system dropped from 85th to 79th, capacity for innovation dropped from 71st to 51st, and technology readiness index dropped from 100 to 115 (Competitiveness Support Fund 2011). It appears that unavailability of adequate human capital, deteriorating technological capabilities, coupled with reduced national/international collaboration/support due to deteriorating country situation has hampered the development of the multilingual library websites. The results also show that lack of interest or awareness of the importance of web-based library services, both by the users and the top management of the libraries, in the country is continued.

VI. CONCLUSION

Despite a significant increase in the number of library websites, no improvement is seen with respect to the availability and accessibility of multilingual content on library websites in Pakistan. It appears that despite the growing number of Internet users in Pakistan and opportunities provided by multilingual library websites, the libraries and their patrons in Pakistan seemed not have capitalized on these opportunities and. Deficiency of required human capital, changed government priorities, and overall deteriorating country situation could have played a significant role in this regard. The analysis of selected library web site's content and services clearly indicates that, with respect to international standards, library web site development and use in Pakistan is still in its initial stages. In order to reap the benefits of the multilingual library websites, the libraries and their patrons need to put the development of library websites in a well-thought process that also provides effective library promotion and marketing.

VII. RESEARCH IMPLICATIONS

The research is significant from two perspectives. First, it provides first-hand findings on the multilinguality of library websites in Pakistan with a focus on challenges and opportunities arising from such

websites. The research findings have important implications for libraries and their patrons in Pakistan for modifying the online content and services provided by libraries for a diverse multilingual population.

VIII. FURTHER RESEARCH AREAS

One possible area where this study can be extended is the analysis of requirements of online content and services by various ethnic groups in Pakistan. This is because a multilingual website is useful only if it provides meaningful content and services to its intended users.

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