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***Information and Communication Technologies Enabled Paradigm Shift and New
Practices in Libraries***

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Abstract

Traditionally libraries have been dealing with the recorded knowledge. The changes in the formats of writing and access have historically influenced the libraries use of technologies. However, the wonderful invention of computer and information access technologies has drastically influenced recording, organization and access to knowledge. Since then the libraries are in a continued change mood. The shifts from physical to virtual, direct access to authors and instant access to globally available knowledge from remote locations are changing the whole scenario of the library profession. Academic libraries being in the forefront of the creation and use of scholarship and knowledge are confronting the innovations influenced by the disruptive technologies. These technologies have impacted library practices significantly. This study is an effort to trace what has happened in the developed world in terms of information and communication technology applications in their libraries & their user expectations, and where we stand in this global phenomenon.

Keywords: Paradigm shift, information and communication technologies, new library practices, library technologies, library innovations

1. Introduction

The information explosion, technological innovation, globalization, rising user expectations, commercialization in scholarly publishing, access to electronic texts, the creation of knowledge & its management are changing the role and direction of libraries at an unprecedented speed. These changes are so swift and drastic that we find ourselves in a

world of change. The advent of computer, Internet, World Wide Web, new storage devices and digital technologies have influenced every aspect of our life and libraries are no exception. The role of librarians as custodians of knowledge and intermediaries has little relevance in the emerging virtual world. The focus has changed from print to digital documents and from real to virtual. Users now have direct access to the source of knowledge through their laptops, iPods using Internet. This rapid transition from real to virtual have major affects on the libraries to remain relevant and effective (Singh 2008).

One of the strengths of the libraries has been the direct and physical access to its readers, interactions on one-on-one basis and in groups. The potential of innovations enabled through the effective use of information and communication technologies have posed serious challenges for the libraries to preserve their traditional strengths, while playing their new roles in the digital information era.

Libraries in many developed countries are also in a transition phase of organizing books to managing knowledge in electronic formats. Some libraries are performing both their traditional printed book regime role complemented with electronic formats. However, librarians' in developing countries like Pakistan are finding themselves in a more preliminary stage of just conversion of printed catalogs to computerized catalogs, and subscription of CDs and few electronic journals. They have not changed their book acquisition, organization and circulation practices, nor have they adopted new roles of knowledge managers (Ramzan 2004). The changes occurring due to technology applications are very swift and we quickly need to move forward to adopt our new roles with new perceptions. Otherwise, we will suffer further due to the already widening digital divide between information rich and information poor countries. Many internal and external factors are forcing a paradigm shift from organizing books to digitally managing knowledge as we enter the twenty-first century.

The expansion of information management technologies has allowed a growing number of professional library duties to be performed by computer literate paraprofessional. Similarly, the enhanced use of computers and digital information has created a volume of available information and computer literate users that could no longer

be handled by the predominant roles of the book paradigm regime. The emergence of a new (digital information) paradigm is likely to happen within next decade or so. It offers an opportunity to the left over / developing countries to leap forward to join the developed world in provision of quality education through effective and efficient libraries. This requires adoption of such strategies that lead to the emerging digital information paradigm. It also requires a complete shift from print to digital collections, remote access, new instructional methods, robust systems, new library practices and innovative staff (Mutula, 2007; Bell et al, 2006; Marshal, 2005).

There have been a number of studies in the developed world, which investigated and reported how they created, managed, adopted and reacted to the challenges and opportunities provided by the new information and communication technologies. Now the question is how we as a profession have responded during the paradigm shifts created by the information technologies. This paper traces the shifts occurs in the developed world libraries and indentifies the extent to which academic libraries in Pakistan have adopted new information technologies. The study of a paradigm shifts is significant because it provides an opportunity for the less developed or left over communities to catch the developed nations through adopting right strategies and innovative technologies and avoiding the mistakes they made during experimental stages of innovations.

2. Paradigm Shifts in Librarianship

A **paradigm shift** is a change in the existing model, which creates a shift in the existing truth. A worldview that has been accepted as a truth, trend or change in a typical pattern or model. The term paradigm shift was first discussed and popularized in 1962, by Thomas Kuhn, through his book entitled ‘The Structure of Scientific Revolutions.’

A **paradigm** is defined as “a set of assumptions about the nature of things that underlie the questions we ask and the kind of answers we arrive at.” A paradigm shift can only occur when the relevant community assents to change values of an accepted paradigm.

A **book paradigm** is defined as “an archetype that identifies knowledge as existing in a physical object of the printed text in a book format, which can be catalogued, and its access controlled by the librarian, as it occupies a particular space in the library model.”

A **digital information paradigm** that is likely to occur, where text, audio, video and all other types of information will be available only in digital format through the Internet. The information here will not exist in one tangible place and cannot be owned or controlled like a physical book or journal.

The evolution in library paradigms is explained in three distinct phases. In phase one; problems are solved slowly, because patrons are reluctant to learn about the new unfamiliar paradigm. This requires a move in the role of the librarian from gatekeeper of knowledge to collaborator or instructor of the knowledge users. In the second phase, things happen rapidly; the paradigm becomes familiar and seems to work smoothly. Library tools are changed and patrons learn to use the tools required by new paradigm. In the third phase, the curve of change flattens, the paradigm capacity for problem solving becomes saturated, and the beliefs and perceptions of librarians are changed. The communication between librarians and their patrons revolves primarily around changes in disseminating information. New problems unsolvable by the paradigm appear and accumulate, and the conditions for another paradigm are formed (Nitecki, 1993; Bell et al, 2006).

From historical perspective, the librarianship can be divided into four periods of transition from book to the modern era. In the first period of evolution, the focus of librarianship was on the process of production, acquisition, preservation, and storage of books. It was the age of the library and librarian as bookkeeper. In the second period, the focus was on bibliographic organization of records and advancements in reprography created to fulfill educational need of the libraries. The issues of the management of library resources provided a basis for the formulation of the theory of the library science. The third period with increasing demands for library services for individual patrons as well as for society at large, awareness of librarians' social responsibility for their work and their mediating role prompted formation of professional standards. Librarianship became a separate and distinct profession, dedicated to the provision of information. This was the

phase of the library as a community builder, linking sources of information with people, and it eventually led to the emergence of the global village of library readers. The next phase started with the introduction of computers, which significantly increased the library's ability to manipulate information records and to expand its services through networking (Nitecki, 1993, Hillenbrand, 2005).

Library as a place is changing as the nature of information is being transformed through the shift from text-based information environments to the networked hyperlinked environment of the Internet. This transformation is demonstrated by an evolutionary shift within the discipline from library science to information science to knowledge management. A number of factors including globalization of information, the information explosion, the revolution in computer technology and the speed of technological changes are responsible for changes in the libraries. Academic libraries are experiencing a rapid transition for print to digital environment (Ross and Senyey, 2008). Holmstrom (2008) mentioned that the revolution in the scholarly publishing industry provides direct access to the end-user by passing the librarians and other intermediaries, so we are experiencing a paradigm shift from a user perspective to a client perspective.

3. Technology Enabled Paradigm Shift in Libraries

Significant changes in the publishing, storage, dissemination, organization and access to information and knowledge are greatly impacted by the use of information and communication technologies. The technology-influenced shifts in the libraries have occurred in three phases. The first is computerization library catalogues, followed by circulation and other library activities. It started in 1960 and was completed by the end of 1980s in the developed world. Libraries in the top academic institutions are using integrated library information management systems to provide one-window access to bibliographic and full-text collections to their on-campus and remote users (McCallum, 2003, Nitecki, 1993).

Second major shift was influenced by the communication technologies. The establishment of communication networks was started in 1970s, which allowed printed resources to

become available online in a digital format. By the mid of 1980 a revolutionary transformation of the information landscape occurred due to extensive use of the telegraph, telephone, radio and TV in the libraries. In 1985, the optical disc came in as a storage and distribution media. Satellite TV was another upheaval in communications technology that enabled global dissemination of knowledge. Finally, the excellent invention of the Internet arrived providing excellent storage, and retrieval (Hillenbrand, 2005).

The third major shift started with the conversion of indexes and abstracts to electronic formats began in the mid 1980s with the advent of CD-ROMs and was complete by the mid 1990s when Web versions of these products were released. Encyclopedias moved to electronic formats in the same way and in the same timeframe and in most cases, print products were abandoned. Large reference sets became available on the Web in the late 1990s and in the early 2000s, a wide variety of more specialized reference materials followed. The indexes and abstracts of the journals moved to the Web in the mid 1990s, followed by full text content of journals available online. The first major database of archive of journals was launched in 1999. By the early 2000s in most disciplines, nearly all-important journal content was available electronically (Frey, 2006, Rhyno, 2003, Ross and Senyey, 2008).

Project Gutenberg has been digitizing and making freely available out of copyright titles since the early 1970s, however, academic e-books first became available in the late 1990s when net Library introduced its first collections. In 2004, Google announced to digitize and make electronically available millions of volumes available in five major US research libraries (Bell, 2006). Google and OCLC have signed an agreement on 19 May 2008 to exchange data with the OCLC participating libraries and through Google search services including the one million full textbooks.

4. ICT in Pakistani Libraries

In the context of Pakistan, the changes occurred due to use of ICT in academic libraries could be divided in two categories. In the first category are the libraries who have embraced computers, library automation and information access technologies to a certain

level. The second category of libraries is those who have online access to indexes, abstracts, full text journals, reference works and e-books. Digital initiatives also fall in this category. The basis for this categorization is the literature review and data collected through a recent survey of 219 (sample of 682) academic libraries by the author.

4.1. Library Automation

Computers were first used in Pakistan Scientific and Technological Information Centre (PASTIC) in 1968 to produce the country's first Union Catalogue of Scientific Periodicals. During the 1980s agriculture universities and research institutes started library automation funded through foreign agencies. Some private academic institutes also started automation of their libraries. Initially, in most of the institutions Inmagic DB Text and some database management systems were used for automation purposes. In the 1990s The Netherlands Library Development Project (NLDP) for Pakistan, helped libraries automation through customization of CD/ISIS, this was later replaced with WIN/ISIS by many libraries (Ramzan, 2004).

Idrees (1995) investigated the status of library automation in 40 libraries of Lahore and found that automation of cataloguing was the dominant activity and CDS/ISIS was the most commonly used software. Sixty percent of the target libraries had one computer, 40% were using CD-ROM technology, 32.5% had e-mail facility and only 2 out of 40 libraries were using Barcode Readers for circulation. Thirty percent of the respondent libraries had a network environment and only one library had an Internet facility. Mahmood (1998) surveyed 19 university libraries in Pakistan and reported that only 16% (3) libraries were using automated cataloguing and serials control and 10% (2) were using automated acquisition while only 6% (1) library was using computers for circulation, interlibrary loan and library management. Results of a study by Saeed et al (2000) revealed that, only 50% of university libraries had access to the Internet and the majority of the libraries had one terminal for this facility. Only three libraries were equipped with more than one computer for Internet access. Four years later a study by Ramzan (2004) revealed, out of 244 academic and research libraries in Pakistan, 57 (23%) respondent libraries did not have computers in their libraries. Only 57% of respondent libraries had e-mail, 53% had Internet

and 20% of the respondent libraries had an intranet facility in their libraries. Regarding the status of library software, the data revealed that 80 (33%) respondents were not using any library software; only 27 (11%) respondent libraries had fully automated library operations.

Findings of a recent survey of 219 (sample of academic) libraries revealed that still 10 (4.6%) respondents did not have PCs, 57 (26%) respondents had one PC each in their libraries. It was good to notice the introduction of wireless LAN in academic libraries in Pakistan as 14% respondents had introduced wireless LAN facility in their libraries. A significant majority, 191 (87.20%) respondents had library software while 26 (11.9%) respondent libraries were still without a library management system. The data revealed that only 18 (8.2%) respondent libraries were fully automated. A majority, 78 (35.6%) were 75% automated, 71 (32.4%) respondent libraries were 50% automated, 25 (11.4%) respondents were 25% automated while 24 (11%) respondents were without any level of automation. Further analysis revealed that a vast majority (more than 91%) of the respondents were still lagging behind in achieving 100% automation of their library operations.

Analysis regarding the availability of information access technologies shows that the majority, 200 (91.3%) respondents had e-mail and Internet facilities in their libraries and 155 (77.8%) respondents had intranet available in their libraries. One hundred (45.7%) respondents had internal OPAC (Online public access catalogue), 118 (53.9%) respondents were without internal OPAC. Only 33 (15.1%) respondents had their own website while a significant majority, 181 (82.6%) respondents, had no website. Similarly, 42 (19.2%) respondents had Web OPAC while 175 (79.9%) were without Web OPAC. Use of barcode labels for check-in and checkout reflects the quality of circulation systems. Sixty-six (30.1%) respondents were using barcode labels for circulation while the majority, 151 (68.9%) respondents, was without barcode system.

4.2. Online Resources and Digital Initiatives

Online resources, especially access to journals through online databases is on the rise even in developing countries. In Pakistan, HEC launched a National Digital Library that now provides access to over 23,000 online journals and 45,000 online books through its availability of full text E-books programme. It was found that the majority 166 (75.8%) of the respondents, had access to the HEC National Digital Library, while, 52 (23.7%) respondents had no access to the National Digital Library resources. In addition, some institutions are also subscribing to a few online databases such as LexisNexis, IEEE Computer Society digital library, Pakistan Law Site, World Bank E-Library, MEDLINE (Said, 2006; Higher Education Commission, 2008; Das, 2008)

Pakistan Research Repository programme now known as HEC Scholars Publications provides online access to thesis, dissertations produced by Pakistani scholars abroad as well as in local universities, and access to local journals (Said, 2006; Higher Education Commission, 2008; Das, 2008). Currently more than 1600 Ph.D. theses published in Pakistan's universities are made available with full text downloadable functionality. The repository is continuously uploading new theses and is estimated to hold more than 3200 theses by the end of 2008. Digitization of M.Phil as well as Master level theses has also been initiated. United Nations Digital Library, Islamabad, <http://library.un.org.pk/gsd/cgi-bin/library.exe> is an online repository of the full text digital documents of the various UN agencies, programs and funds having country offices in Pakistan. This collection comprises the documents reports, publications, newsletters and public information items. Akhtar Hameed Khan Resource Centre (AHKRC) Digital Library <http://www.lisolutions.org/gsd/cgi-bin/library.exe> is an open access digital archive that provides full-text access to some important works of Akhtar Hameed Khan and Shoaib Sultan Khan, publications of National Rural Support Programme (NRSP) and digital images of the activities of NRSP/AHKRC. This repository also provides access to some selected journals and reports to the registered users.

There are few initiatives has been taken by some local organization to digitized locally available material like Pakistanlawsite.com and Paksearch.com. Universities are now planning to start institutional repositories using open source software like D-Space,

Fedora, Green Stone and e-prints. They are **Paksearch**, <http://www.paksearch.com> Paksearch is Pakistan's largest and most up to date site containing business publications, statistical data, annual reports, government laws and regulations related to business law, insurance, prescription drugs, debt, sales tax, customs tariffs, company and banking governance. Pakistan agriculture, <http://www.parc.gov.pk/data/CatPak/catalog.asp>, Pakistan Agriculture contains bibliographic information of literature published in Pakistan or elsewhere in the world about Pakistan agriculture. It is facilitating the scientists to identify, locate, and use research literature. From 1997, abstracts have also been added. Total records in the database are more than 53,000. Pakistan Law Site, <http://www.pakistanlawsite.com>, Pakistan Law Site ensembles the idea of LAW ONLINE. This is one stop resource site for statutes, rules and cases related to Pakistan. This site is one of its kind and houses all the federal and provincial statutes and cases related to these statutes. Taxation, service, copyright, state planning, labour and all kinds of fiscal statutes are covered in this site. Moreover, there are 1200 essays, articles and other legal documents available at this database. It also houses all the journals of PLD Publishers like PLD, SCMR, CLC, PCrLJ, PTD, PLC, CLD and YLR., VISTA – Vital Information Total Analysis, <http://www.vis.com.pk/index.asp>, It provides access to complete historical database of the companies, published accounts, including half-yearly, since as far back as 1990. The database carries historical stock price, trading volume, summary of the director's report, name of the auditors, CEO, principal products, etc. It is updated weekly. VISTA enables the analyst to perform, in a windows based and user-friendly environment, a comprehensive analysis on fundamentals of a company, in relation to other companies in the sector. One could analyze various sectors also, on a wide variety of parameters and ratios.

5. Hybrid Academic Libraries

The recent increase in digitization of information has been the greatest catalyst for change in the profession from book paradigm to the emerging digital information paradigm. Academic libraries being at the forefront of the institutions knowledge, scholarship and research mission are continually confronting the innovation challenges.

Faculty, students and researchers expectations of remote, instant, relevant, authenticated information from global resources accessible 24/7 remotely is on the rise. The innovations in the formats of information, especially the digitization, and World Wide Web and other information access technologies are important factors that are changing the shape of libraries at an unprecedented rate (Frey, 2006, Rhyno, 2003). The emergence of a new paradigm is visible now. Lewis (2004) mentioned that academic libraries will confront a variety of disruptive technologies and these technologies will disrupt libraries. The current structures and practices of libraries will no more withstand the technological changes we are facing than the changes we faced with the invention of the printing press. To take the most obvious example, Google aims to digitize and index all of the world's printed literature. It means all books will be available full text, searchable and available to everyone with an Internet connection, which requires a real change beyond incremental adjustments.

There are workable strategies suggested by scholars (Lewis, 2007, Rosa, 2006, Suber, 2007, Greenstein et al, 2007) to cope with the emerging digital paradigm challenges and opportunities. First, is the complete migration from print journals, reference works, books and other collections to electronic collections? This also requires dislocation and preservation of print collections to the less used areas so that access is made as and when required. Second is reshaping the library as informal learning space allowing use of cell phones, tea, snakes and group discussions, integrating the library with rest of the campus units, such as, language labs, writing learning center multimedia services and similar common academic activities. Next is repositioning library tools, resources, and expertise so that they are embedded into the teaching, learning, and research enterprises. There is widespread high use of general Internet information resources among the students. They regularly use search engines, e-mail and instant messaging to obtain and share information. A number of surveys results have indicated that the library is not the first or only stop for these information seekers. Search engines are the favorite place to begin a search and respondents indicate that Google is the search engine most recently used to begin their searches. Undergraduates live on the Web. They begin, and often finish, their research with Google, and mostly use the library as a place to study. Both students and faculty will use the general Web search engines as their primary discovery tools (Ross and Senyey,

2008; Schonfeld and Guthrie, 2007. Library tools, resources, and expertise need to be where the users are. The truth is that if you cannot get to the library from Google, you will not go there. Libraries need to use linking strategies to make this simple and easy. The last but not the least is to migrate from purchasing materials to getting access to contents. The transition of information from print to electronic format is clear and its impact is obvious. However, there is an equally important transition and that is the transition from purchased to open access content. This transition will do more to reshape what libraries will be and do in the future. There is an active movement for provision of open-access (OA) to literature that is digital, online, free of charge, and free of most copyright and licensing restrictions that need to be considered seriously.

6. Conclusions

New technologies are changing the information landscape of at a fast rate. This creates opportunities and challenges for libraries to re-visit their missions, reform their policies, change their roles and bring innovations in their collections and access and management infrastructures to remain relevant and competitive in the contemporarily society. The emerging digital information paradigm provides another excellent opportunity for library community to stay relevant and transform themselves into value-adding knowledge professionals. This will require a radical change in how we view ourselves, our roles within the knowledge-based economy in a world of rapid change, instantaneous communications, and the transformation in our work environment. In other words, we need to have a vision; we need to define the future.

The situation regarding response to ICT enabled paradigm in Pakistani libraries is very discouraging compared to the developed world. However, this is a timely alert for the library professionals and other stakeholders in Pakistan to leverage the benefit of the new paradigm and start promoting the use of online journals, books, reference works and data sets in our libraries. This is also a good time to start conversion of our print collections into digital format. Faculty, students and researchers also need to be taken on board for these initiatives through information literacy programmes, as they are the end-users of our resources. Drastic changes and innovations are deemed to happen if we are to compete the

develop world in provision of high quality education positively impacted through effective academic libraries. To ensure that we librarians continue to stay relevant, we must also need to adopt innovative attitude and culture so that we not only manage to keep pace with, but also are always ahead of the competition, as the bar level of competition is continuously raised.

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