

## Towards a Digitization Framework: Pakistani Perspective

**Muhammad Rafiq**

Department of Information Management, University of the Punjab, Lahore, Pakistan Email: [dr.rafiqm@gmail.com](mailto:dr.rafiqm@gmail.com)

**Kanwal Ameen**

Department of Information Management, University of the Punjab, Lahore, Pakistan Email: [kanwal.ameen@gmail.com](mailto:kanwal.ameen@gmail.com)



The study assessed the opinions of the Pakistani library experts in terms of: organization for digitization work (execution of digitization work & staffing patterns); funding patterns; and access patterns for digitization projects. The study opted qualitative research design and in-depth interviews were conducted to collect the data from purposely selected library experts from different parts of Pakistan. The findings bring forward an outline of digitization framework in terms of execution of digitization work, staffing patterns, funding patterns and access patterns.

**Keywords:** Digital Access, Digital Library, Digitization Framework, Library Funding, Pakistan, Library Staffing.

### 1. Introduction

The digital revolution in Pakistan is accelerating fast. The low speed dial-up connection got replaced with the broadband, and the most recently 3G and 4G mobile internet has been launched. High-speed Internet connectivity has enabled faster searches and seamless access to a wealth of media through common interfaces. According to Internet Service Providers Association of Pakistan (ISPAK), the number of estimated Internet users has reached 25 million, while Teller (2013) reported 30 million Internet users and 120 million mobile/cell phone subscribers. The Government of Pakistan is spending Rs. 22 billion on rural telecom development through the Universal Service Fund. The country's total teledensity has been increased to 72 % (Ministry of Finance, 2013) and over 250 towns and cities across

the country are now connected through fiber optic network. Telephone density or teledensity is the number of telephone connections for every hundred individuals living within an area. Mobile financial services have recently been launched by various operators in Pakistan, with transactions worth Rs3.76 billion via online banking (Sheikh, 2013). Such developments show the transformation into a digital economy where information access is pivotal.

Digitization has transformed the modes of accessing information and knowledge resources. The education sector is a major one to make use of digital technology to enrich the educational experiences at all stages of the learning journey (Joint Information Systems Committee, JISC, 2005). University libraries are digitizing their valued print resources to offer online access and meet the information needs of the academic community world over. In Pakistani context, Ameen and Rafiq (2009) reviewed different digital libraries of the country that were the outcome of some digitization activities. It was also noted in another study that digital information resources are preferred by information users in the higher education sector of Pakistan (Rafiq & Ameen, 2012).

The Higher Education Commission (HEC) initiated a number of projects to transform the Pakistani higher education sector. A breakthrough project was the Pakistan Education and Research Network (PERN), launched in 2002, to enhance the communication infrastructure of the institutes of higher learning and research organizations to meet their networking and internet needs. Currently, it is serving 183 academic and research institutes. HEC-National Digital Library Programme (HEC-NDL) and the digital Pakistan Research Repository (PRR) projects aimed to address the researcher's information needs. NDL offers online access to more than 23000 e-journals and 40000 e-books of international publishers (NDL, 2014). PRR is a digitization project of HEC that offers online open access to PhD dissertations produced in Pakistani

degree awarding institutes (Pakistan Research Repository, 2014).

University libraries in Pakistan are striving hard to improve their human, financial, knowledge and other material resources. Their services has been improved with the access to global knowledge reservoirs through NDL. The university libraries initiated digitization programmes. However, digitization to date in university libraries of Pakistan is at budding stage and born out of the heat of new technology. A study (Rafiq & Ameen, 2013) reported that one-third of university libraries of Pakistan were engaged in digitization activities. Nonetheless, this study revealed that digitization activities were taking place in isolation in absence of a formal digitization policy. Digitization projects require considerable amount of financial, human, and technological resources. It was assumed that international guidelines in terms of project execution might not work in the local context without adaptation. It requires a uniform digitization framework to meet the national needs. Thus, it seemed necessary to seek the opinions of library experts regarding a possible digitization framework for the country.

## 2. Aim of the study

The aim of the study was to assess the opinion of the library digitization experts of Pakistan on different aspects of the digitization work that will help to outline a digitization framework. The focus was on practical aspects of digitization project execution instead of technical standards. The study assessed the opinion of the key respondents in terms of: organization for digitization work (execution of digitization work & staffing patterns); funding patterns; and access patterns of digitization projects.

## 3. Literature review

A number of guidelines covering a wide range of digitization aspects including digitization methods, techniques, digital imaging, selection criteria, metadata, taxonomy, etc. are available. Their focus remains on technical aspects instead of practical aspects of digitization project execution. The focus of this study was on project execution hence, the researchers excluded the guidelines which covered methods, techniques, digital imaging, selection criteria, metadata, taxonomy etc. The following section reviews the most relevant and available works.

NISO (National Information Standards Organization, 2007) recommended *A Framework of Guidance for Building Good Digital Collections* for cultural heritage organizations and funding bodies that were

planning or implementing digitization projects. The framework was prepared by the NISO Framework Working Group with support from the Institute of Museum and Library Services, USA. The framework provided an overview of some of the major components and activities involved in digitization, identified existing resources (books, web resources, guidelines, etc.) that supported the development of sound local practices for creating and managing digital collections; and encouraged community participation in the ongoing development of best practices for digitization. The *Framework* provides criteria for goodness, organized around four core types of entities: Collections (organized groups of objects); Objects (digital materials); Metadata (information about objects and collections); and Initiatives (programs or projects to create and manage collections). A number of principles have been recommended for building digital collections.

The Joint Information Systems Committee (JISC) published a report in 2005 that suggested need for a UK digitization framework. This report was based on the Loughborough University's study on digitised content in the UK research libraries and archives sector (Bultmann, Hardy, Muir, & Wictor, 2005). It reported that the investment in digitisation project had amounted to £130 million over 10 years, in UK. The study discussed the digitised resources in the UK; standards, formats and guidelines; funding structures and opportunities for digitisation projects. The report advocated the need for a UK digitization framework and recommended to adopt a flexible framework that would assist in filling gaps in provision of digitised contents and should enable coordination of existing services related to digitization.

Tharani (2012) proposes "a service-oriented framework for academic libraries to reimagine and mobilize collections' digitization as part of broader library services". The proposed framework is based on the Service Framework for Digital Libraries developed by the Digital Library Federation (DLF), whereby digitization activities have been formalized into discrete processes and functions. The issues and challenges that academic libraries may face in mobilizing digitization services are also discussed in the context of a collaborative community digitization initiative undertaken by two Canadian academic libraries.

In the perspective of developing countries, especially with the similarities in social, political and economic environment with Pakistan, Indian literature discusses the issue of framework development. For example, Qureshi and Khan (2006) discussed a framework with a focus on data capture, data storage and data

dissemination. The authors “emphasised on the suitability of the methods to deal with the varied requirements of the digital library initiatives”. They discussed framework in the context of a digital library and not of digitization processes. Natarajan and Bhakta (2008) presented the issues and problems in building a digitization framework in India. The study listed the checklist for digitization with the key issues for managing the technology including the project planning, resource management, feasibility studies and costing of the project. The digitization framework was discussed in terms of an inventory of digitisation projects; raising awareness of digitisation; training and re-skilling staff in digitization activities; developing networks, collaborations and relationships for digitisation activities; obtaining funding to support digitisation; instigating digitisation projects; enhancing the IT infrastructure; and strategic planning and policy development. The problems of getting copyright clearance by contacting rights holders and the moral rights of authors were highlighted. However, the article did not present any empirical data. A review of the local literature showed that the studies on the use of various technologies in libraries have been perused, but this area has not been addressed.

#### 4. Research Design & Methodology

The study used a qualitative research design to meet its aim/s. Purposive sampling technique was used to explore the opinions of the professional experts. Hence, twenty-seven library experts from different parts of Pakistan were selected on the basis of their positions, experience and established expertise in librarianship of Pakistan. The consultation with some senior professionals was also made to finalise the sample. Attention was given to ensure diversity of the sample and representation from all four provinces of the country. One interviewee from private sector was General Manager Archives of a major electronic media group. The decision to include him was taken considering his vast experience in university librarianship as well as in digitization projects. Other experts were also chosen carefully to make this study meaningful. Table 1 presents the profiles of the sample; 16 respondents were from public sector institutions and nine belonged to private sector. In terms of interviewees’ primary work responsibilities, 19 were library practitioners and six belonged to teaching faculty. Provincial representation also showed a good blend of interviewees (Table 1).

**Table 1: Interviewees’ Profile**

<i>Variables</i>	<i>Freq.</i>	<i>Percentage</i>
<i>Type of Parent Institution</i>		
Public sector	16	64
Private sector	9	36
<i>Primary Role</i>		
Library Practitioner	19	76
Faculty/Teaching	6	24
<i>Provincial Representation</i>		
Punjab	7	28
Sindh	12	48
Baluchistan	1	4
Federal Area/Capital	5	20

Telephonic and email contacts were used to fix appointments with the interviewees. Semi-structured in-depth interviews were conducted in the offices of the interviewees, except two. The researcher visited Karachi, Rawalpindi, Islamabad, and Lahore to conduct the interviews. The researcher did not visit Quetta and Peshawar because of the deteriorated conditions of law and order in these cities. The interview of a library expert from Quetta was conducted in Karachi, when he was on a visit for another meeting.

The research used an interview guide comprised of related themes for conducting the interviews instead of structured questions. The themes were extracted from the available body of literature on the topic. An initial rapport was developed with the interviewees before conducting formal interviews. All interviews were recorded using an electronic voice recording apparatus with the permission of the interviewees; hence they were comfortable with the recording. The respondents were given option to talk in English or Urdu languages to avoid language barrier in the pursuance of obtaining their real insight. The interview themes were explored in an exhaustive manner. The duration of the interviews varies from 20 to 45 minutes. The recorded interviews were supported with notes taken during and just after the interviews to enhance the strength of the data.

Two respondents revealed their lack of knowledge and insight in terms of library digitization during interviewing process. Those interview transcripts were excluded from data analysis. Hence, the data presents the opinion of twenty-five experts.

A thematic analysis of textual data was conducted. The recorded interviews were transcribed in English with professional objectivity. A summary of the analysis was extracted from the interview transcripts manually. Comments and quotes from the transcripts have been used to enhance the validity in interpretation of the opinions and the content. The study ensured the anonymity of the interviewees by referring the quotes from interview transcripts without their names.

## 5. Data Analysis

The identified themes regarding digitisation framework were probed extensively during the interviews. The analysis of data is presented below:

### 5.1. Organization of Digitization Work

First of all, the interviewees were requested to share their insight about the ways of execution of digitization work in libraries. The opinion was collected on two sub themes: 1) Execution of digitization work, and 2) Staffing pattern.

#### 5.1.1. Execution of digitization work

**Table 2: Execution of digitization work (N=25)**

<i>Content Analysis of the Responses</i>	<i>Freq.</i>
In-house execution of digitization work should be done	15
Collaborative/resource sharing efforts should be made	7
Decision of in-house or outsourcing execution depends on the type of project and library resources	6
Outsourcing is not feasible in the current scenario	5
Centralized setup for digitization work	1
Separate units for digitization work	1
Hybrid approach: Digitization of objects should be in-house and post-processing including metadata assigning, publishing, etc. may be outsourced	1

Developing a centralized setup; establishing separate units in libraries; and hybrid approach (mix of in-house and outsource) for digitization work was also mentioned with a single frequency for each.

## Interpretation and Discussion

A majority of the interviewees considered that digitization work should be done in-house. They opined that library staff should develop their skills required for digitization. They suggested that it should begin with small scale projects so that librarians learn by doing it themselves. In-house execution of digitization work will empower the library staff. A chief librarian from Islamabad stated, "We need to learn, train our staff, and understand the issues involved in digitization work. We learnt all ourselves by doing an ETD (Electronic Theses & Dissertations) project. Had we outsourced we would have never become aware of the related aspects and issues". The findings are aligned with the reasons found in the favour of in-house digitization by Bultmann, Hardy, Muir, and Wictor (2006). In their study on digitized contents in the UK research library and archives sector, a majority of the respondent institutions favoured in-house digitization because of: (i) better control of procedures and handling of the originals (ii) preferred to keep the original onsite (iii) development of staff skills (iv) small-scale projects and (v) the presence of internal expertise.

Five interviewees rejected the option of outsourcing in the current scenario. One of the reasons mentioned by a few interviewees was the non-availability of companies offering digitization services in the country. Another chief librarian pointed out, "When such projects are initiated, the companies emerge and out-sourcing can be done. But it will only happen when a number of libraries show their desire. In other words, right now, we need to do in-house digitization because at this time outsourcing options hardly exist and will be very costly".

The execution of digitization work, of course, also depends on the type of a project and strength of library collections. It was mentioned that if the library staff has the expertise, ample technological resources and long-term commitment to digitization activities, it is appropriate to go for in-house digitization. However, if digitization work is a one-time activity and a library's staff lacks the required expertise or time, and technological resources, or if there is a huge quantity of backlog to digitise, outsourcing should be a better way to get it done.

The notion of doing it by university libraries in a collaborative manner with sharing resources was also expressed. Collaborative approach might be much desired, however, as mentioned under the headings of 'Major Issues' and 'Cooperation', the scenario of Pakistani librarianship does not show impressive examples of resource sharing throughout its history. A number of interviewees mentioned that majority of



the librarians are working in isolation whereas initiating resource sharing networks is more important. One interviewee mentioned that higher administration is also not in favour of resource sharing with other university libraries. Still libraries are far from the basic form of formal lending like Inter Library Loan (ILL). Ameen (2008) also mentioned certain technical, procedural, psychological, and behavioural barriers hindering resource sharing. Hence, collaboration in this regard seems merely wishful thinking.

There were also some other suggestions mentioned by interviewees, i.e., development of a centralised facility to digitize libraries' material; establishment of specialised units for digitization work within libraries; and a hybrid approach meaning scanning and conversion of documents in-house while post processing including metadata assigning, and system settings outsourcing. Though, a wish for a centralised setup for university libraries was expressed, it seems hard to establish as it requires a strong commitment for generating and sharing resources besides an agreed upon mechanism that lack among university libraries. Furthermore, interviewees seemed not fully aware of all the intricacies of digitization.

### 5.1.2. Staffing pattern for digitization

A few sentences to introduce this part telling what the theme/or point was in exploring this.

**Table 3: Proposed staffing pattern for digitization work in libraries (N = 25)**

<i>Contents Analysis of the Responses</i>	<i>Freq.</i>
Should train and use existing library staff	23
IT professionals may be also hired	10
If IT professionals are hired, they should work under the library administration,	3
More involvement of IT professionals may replace librarian in future	3
Libraries can get volunteers	2
Induct new LIS staff with needed skills for digitization projects	2

### Interpretation and Discussion

A vast majority of interviewees were in favour of training and using the existing library staff for digitization work. The most noteworthy claim made by them was that only librarians know the information needs and seeking behaviour of their users. It is a fundamental pre-requisite for the success of

digitization projects. Hence, they are in better position to make right decisions in terms of needed digitization. The interviewees firmly expressed that if libraries want to sustain their digitization projects, they need to train their professional staff members.

Nevertheless, the majority felt insecure from IT professionals and feared that they might replace librarians in future. An interviewee stated, "We should train our own library professionals to expand the professional canvas. If we will induct computer science professionals, we will shrink the canvas for LIS graduates". Some interviewees mentioned that IT professionals should be under the librarian. "Libraries need IT professionals for assistance not for dictation", one chief librarian of a public university said. The basis of this fear may be traced from the past experiences of libraries. For example, a chief librarian of a private university shared, "Traditionally, we used IT people in automation projects, but computer professionals tried to dominate and assert authority over the library professionals". Nevertheless, they admitted that a number of digitization tasks can be handled by IT professionals in more efficient and effective way, e.g. building and maintaining library systems to offer online access to digitized objects. They have also mentioned that all LIS professionals are not well-versed in technological application. It seems appropriate to induct IT professionals for specialised works like system creation and maintenance. It is a fact that library resources, processes, and services are becoming generally technology dependent. Hence, library needs staff with the required IT skills. It was also stated by the respondents that in LIS schools, students learn some basic IT skills but not enough. Their opinion may be summed as follows: libraries need to add IT professionals to develop, install, and maintain the technological systems while librarians should select the material for digitization and make decisions about access patterns. It is necessary to join hands with computer/IT professionals to carry out digitization projects successfully and create digital libraries. It may be accomplished by creating new positions like system programmer, web developer, etc. in the library's staffing pattern, as suggested by a respondent.

### 5.2. Funding Sources for Digitization Projects/Activities

Digitization is a costly process and requires a significant amount of continuous funding for equipment, processing, post-processing of digitized material and sustainability. Therefore, it felt necessary to gather the opinion of the interviewees about the funding pattern that Pakistani university libraries may opt. The analysis is as follows:

**Table 4: Funding sources for digitization projects (N=25)**

<i>Contents Analysis of the Responses</i>	<i>Freq.</i>
Libraries should welcome funding from any source for this purpose	21
Start digitization by internal funds, and later on explore alternative sources	15
Be self-sufficient and generate funds internally	3
Funding pattern depends on budgetary policy of the institution	2
HEC should provide funds specifically for digitization projects	2
Big or national level projects need to explore alternative financial resources	1
Generate funds by offering fee based access to some digitized contents	1
Libraries need to devise/extend the policy in terms of alternative funding	1

Analysis of opinions illustrates following mix model for getting funds based on internal as well as external resources to support digitization activities in university libraries (Table 4).

### ***Interpretations and Discussions***

Out of 25 respondents, 21 explicitly suggested to welcome the funds irrespective to the funding body. However, fifteen respondents suggested that initially libraries should start digitization activities by internal or regular funding. They agreed that it is easy to secure alternative funds by demonstrating some pilot projects. They considered that libraries may accomplish such pilot projects by internal funding that will be a good justification to attract alternative funding.

University libraries of the country hold many collections rich in cultural, historical and scholastic value. These resources include manuscripts, rare books, artefacts, old journals, etc. The respondents considered that such valuable resources have the potential to get support for digitization and marketing of these resources may be instrumental for getting funds.

The role of HEC was also considered important in providing funds for digitization projects. HEC provides Pak Rupees (US\$ 11765/-) grant to libraries under the head of "Institutional Strengthening /Up-Gradation of Laboratories". Libraries are entitled to

receive this grant to purchase the following equipments/books for library:

- Photostat machine, Scanner.
- Reference books, rare books etc.
- Research Journals.
- Software, Subscription database ( to provide electronic resources by subject)
- Personal computers maximum number up to 05 (to use the database in libraries), provided if already not available

This grant is for a one-time purchase of equipment, library material, etc. It is not a regular grant and offers a small amount as compared to the costs of a digitization project. The nature of digitization projects requires the funds for staffing, equipment and process execution. It was proposed by a couple of the interviewees that libraries need to use funds from both internal and external resources. Funds from external resources, e.g. HEC, may be used to acquire technological equipments but internal funding may be obtained for staff salaries etc.

Some respondents also talked about alternative funding channels from international foundations, institutions and private donors. Procuring such grants requires exploring funding sources, preparing the case and proposals. It is the researchers' observation that librarians generally lack these skills. Moreover, libraries need to devise/extend the policy in terms of alternative funding for university libraries, which is not yet an explored option.

### **5.3. Access Patterns**

Deciding on access pattern (i.e., fee vs. free; single vs. multiple interfaces etc.) to digitize contents is considered an important part of any digitization project (or framework). Therefore, it seemed necessary to probe the interviewees' opinion about access pattern that may be adopted for digitization activities/projects.

**Table 5: Access pattern to digitized contents (N=25)**

<i>Contents Analysis of the Responses</i>	<i>Freq.</i>
Single interface and central repository	16
Full text online access for free	13
Depends on the type and objectives of the project	8
Fee based access	8
Central repository of bibliographic data, and full text access through institution's library website	7

Hybrid model	5
Central repository under the HEC	3
Central Repository may stop the duplication of digitization work	2

### ***Interpretation and Discussion***

The Majority of interviewees favoured open access to their digitized contents. Eight interviewees considered that full-text fee based access is viable. Five interviewees explicitly favoured the adoption of a hybrid model of access. Two types of hybrid models were suggested:

1. Free full-text access to general contents and fee based access to special collections.
2. Free full text access for Pakistani academia and fee based access to foreign institutions

As far as the first model is concerned, some interviewees considered that fee based access to information is against a library's philosophy and might be a hindrance in promotion of education and research in a country like Pakistan. It might be hard for the local users to spend money for accessing digital contents. Digital culture is just beginning and fee-based access will deter users. In terms of the second type of mode, some respondents stated that we need to get attention of global researchers about the resources available in Pakistani libraries. They mentioned that libraries cannot get enough money by fee-based access unless they become commercial vendors. It will be inappropriate to adopt fee based access pattern at the current stage because libraries are at the early stage of digitization.

Access through a single interface and central digitized repository appeared a favourite one. However, a central digital repository may be seen in terms of two aspects i.e. i) Central repository to digitize printed material, and ii) Central repository to access digital content. The example of Pakistan Research Repository (PRR), a project operated by a private company for Higher Education Commission of Pakistan (HEC), may be considered in the context of this debate. PRR digitizes PhD theses produced by the doctorate students at Pakistani universities to make them available through a single interface. PRR adopted a mechanism to collect the copies of doctoral theses through university libraries. However, a number of theses were still not available with PRR. It seems hard for an agency to digitize special collections of different university libraries.

In terms of second option, the access through a single interface by sharing the copies of digitized material

may be beneficial in the users' perspective. Central repository, mentioned by a couple of interviewees would stop the duplication of digitization efforts for the same contents. Nevertheless, to go for the second option, it will be necessary to follow some uniform standards for the purpose of interoperability and data exchange. Moreover, establishing a central repository requires the provision of sophisticated infrastructure, human resources, maintenance, ample financial resources and an agreed upon administrative setup. Furthermore, the transportation of documents to and from the centralized repository would need safety measures to avoid any damage to the rare materials. Three interviewees considered that the central repository should be under the HEC. In the beginning, HEC may formulate a group of experts to initiate such a repository by providing funding and administrative support. However, it will be on part of the university libraries to establish such a repository. It will require collaborative efforts from the university libraries. Resource sharing and consortia approach may be effective in this regard.

### **6. Conclusions**

In the light of collective input obtained through interviews and their analysis, it may be concluded that in-house execution of digitization work may be preferred; however, this decision should be based on the type of project and strength of institutional resources. Collaborative approach is essential and can be an effective approach for the success of digitization projects. Collaborative approach may also address the sustainability issues of these projects in long terms. In terms of staffing patterns, libraries may use existing library staff to do digitization, however, IT professionals may also be hired for technical and system support. Nevertheless, it was found that a fear exists among LIS professionals about the hiring of IT professionals in libraries. In the beginning, libraries may start digitization projects by internal funds and alternative funding sources may be explored later on by showcasing already accomplished digitization work. Single interface, open access, central repository was preferred. However, a hybrid model was also recommended by considering the nature of digitized collection.

### **7. Recommendations**

1. A collaborative approach might be opted for wider access and long-term sustainability of the digitization projects. Universities should join hands to meet the demands of this digital era. Resource sharing networks and consortia approach will be instrumental to address the user needs and digitizing library resources.

2. In terms of staffing patterns, libraries should use existing library staff, however, as IT skills are increasing required for digitization work; it is recommended to enhance the IT skills of library staff by supporting their continuing professional development activities.
3. Libraries may start digitization projects in the beginning by internal funds and explore alternative funding sources later on by projecting their accomplishments. Of course, digitization is a costly process and libraries should explore and welcome every source of funding to support their digitization endeavours.
4. It seems reasonable that specialised units for digitization work may be established in large libraries which have a large number of valued resources for digitization.

In terms of access patterns, single interface, open-access central repository was preferred. However, a hybrid model may be followed in certain cases. There are certain valued resources that have the potential to generate funds. Thus the access to such resources may be on fee basis while access to other resources may be through open access.

## References

- Ameen, K. (2008). Perceptions and self-assessment of university librarians regarding Collection Management (CM): a case study of Pakistan. *Collection Building*, 27(4), 167-173.
- Ameen, K., & Rafiq, M. (2009). Development of digital libraries in Pakistan. In Y. L. Theng, S. Foo, D. Goh & J.-C. Na (Eds.), *Handbook of research on digital libraries: Design, development, and impact* (pp. 482-491). Hershey: PA: Information Science Reference.
- Bultmann, B., Hardy, R., Muir, A., & Wictor, C. (2005). Digitised content in the UK research library and archives sector – A report to the Consortium of Research Libraries and the Joint Information Systems Committee. UK.
- Bultmann, B., Hardy, R., Muir, A., & Wictor, C. (2006). Digitized content in the UK research library and archives sector. *Journal of Librarianship & Information Science*, 38(2), 105-122.
- HEC-NDL. (2014). HEC-National Digital Library. Retrieved January 01, 2014, from <http://digitallibrary.edu.pk/Index.php>
- ISPAK. (2013). Internet Service Providers Association of Pakistan (ISPAK). Retrieved November 17, 2013, from <http://www.ispak.pk/>
- Joint Information Systems Committee (JISC), U. (2005). Digitisation in the UK: The case for a UK framework. UK.
- Ministry of Finance, G. o. P. (2013). Pakistan Economic Survey 2012-2013. Islamabad: Ministry of Finance, Government of Pakistan.
- Natarajan, M., & Bhakta, U. (2008). *Developing a framework for digitisation: Issues and problems*. Paper presented at the National Conference on Recent Technological Trends in Management and Library System: Issues and Challenges, Asia-Pacific Inst of Management, New Delhi <http://knowgate.niscair.res.in/jspui/bitstream/123456789/78/3/DEVELOPING%20A%20FRAMEWORK%20FOR%20DIGITISATION.pdf>
- National Information Standards Organization. (2007). A framework of guidance for building good digital collections (3rd ed.). Baltimore, MD.
- Pakistan Education & Research Network. (2013). Pakistan Education & Research Network. Retrieved January 01, 2014, from <http://www.pern.edu.pk/>
- Pakistan Research Repository. (2014). Retrieved January 01, 2014, from <http://eprints.hec.gov.pk/>
- Qureshi, I. H., & Khan, R. A. (2006). Digitization of knowledge: A framework. *Trends in Information Management*, 2(1), 9-21.
- Rafiq, M., & Ameen, K. (2012). Use of digital media and demand for digitized contents in higher education sector of Pakistan. *International Information & Library Review*, 44(3), 116-122.
- Rafiq, M., & Ameen, K. (2013). Digitization in university libraries of Pakistan. *OCLC Systems & Services*, 29(1), 37-46.
- Sheikh, S. (2013, July 1). The future of ICT in Pakistan, *The Express Tribune*. Retrieved from <http://tribune.com.pk/story/570485/the-future-of-ict-in-pakistan/>
- Teller, S. (2013). Pakistan market trends 2013: Online, mobile, social – Things are about to take off. Retrieved from <http://ansr.io/blog/pakistan-market-trends-2013-online-mobile-social/>
- Tharani, K. (2012). Collections digitization framework: A service-oriented approach to digitization in academic libraries. *Partnership: The Canadian Journal of Library & Information Practice & Research*, 7(2). 1-13.