Information Communication Technology Applications used to Enhance Knowledge Management in the University Libraries of Pakistan

Sadia Arshad, Hafiz Abdur Rehman, Liaquat Ali Rahoo, Muhammad Ali Khan Nagar
[1] Deputy Librarian, [2]Senior Librarian, [3]System Administrator [4]Lecturer
Barrett Hodgson University, Karachi, Comsats University Islamabad, Mehran University of Engineering & Technology, Pakistan
Email: sadia.arshad@bhu.edu.pk, arehman@comsats.edu.pk, liaquatalirahoo2003@gmail.com , muhammad.nagar@faculty.muet.edu.pk

***Abstract* - Information and knowledge has gained superiority in the present age where people believe that information is the most powerful weapon that leads a nation to progress. Knowledge is considered as the most important asset that leads a nation to progress and development. The Universities impart knowledge and the University Libraries, the place where knowledge accumulates, support the curriculum. Hence knowledge management gains importance. ICT is the major tool that helps the library professionals to provide better service to the users. The paper examines whether ICT enhances KM in University Libraries and also its effectiveness to the users. It is part of the study conducted to analyze the 'application of KM in University Libraries in Pakistan'.**

***Keywords*: Information Communication Technology, Knowledge Management, University libraries**

I.INTRODUCTION

Information and knowledge has become the most coveted asset that helps a nation in its pace towards progress. The wealthiest nation is the nation that possesses information. Universities are considered as pillars [1] of society. University is the institution that imparts knowledge, innovate ideas, enriches the understanding and also moulds the personality of the citizens and thereby creates a civilized society. It is the place where ideas and knowledge are exchanged, generated, experimented, and promotes free thinking and it thereby becomes an integral part of society. University libraries also support its parent organization in fulfilling its vision and mission by carefully acquiring and disseminating the needed information. Right information, to the right person, at the right time has been the motto of the library professionals everywhere. The advancements in Science and Technology have enhanced the working of the library to a great extent.

The printing technology has brought about 'Information Explosion' and as a result the library professionals are forced to invent new ways and means to get control over the ever flowing information. Now we have entered the knowledge era where knowledge has become more powerful. Managing knowledge has become a tough task. Timely information has great significance in the present day world. Hence library professionals have made use of Information Communication Technology to provide better services to the users. The paper discusses the use of ICT to enhance knowledge management in UL.

A. Data, Information and Knowledge

Data, Information and knowledge are interrelated terms. Data from the raw facts which when processed becomes information. Information when processed and organized becomes knowledge which is used widely in decision making. Davenport and Prusak differentiate data, information and knowledge on the basis of value adding processes that transform raw material into communicable messages and then into the concepts like knowledge.

B. Knowledge Management

Knowledge [5] is a major resource in any institution or organization whether it is academic, research, business or industrial organization. Knowledge Management is an interdisciplinary subject which has its hold in library management also.

The term Knowledge Management [6] has been viewed with different perspectives. To the information system researchers, it is an object that can be recognized and controlled in computer -based information systems. To the Management people, it is a process based on individual and organizational competencies such as skills and know-how [7], [8], [9], [10]. In simple words KM means management of knowledge. It is the management of organizational knowledge for creating business value and generating a competitive advantage. It is a key factor for future successful enterprises [11], [12] stated that knowledge management is a journey that moves an organization from a knowledge-chaotic environment - which is where many organizations are now - to a knowledge-centric enterprise that is supported by a comprehensive knowledge system.KM is concerned with the leveraging knowledge that exists in an organization and creating new knowledge in the process [13].

C. Areas km in University Libraries

The advancements in technology brought new equipments to collect , process and disseminate information available in a variety of formats, as the publishing technology also have changed from print materials to e-resources. The routine works in the traditional libraries gave place to technology. Information and Communication Technology (ICT) has brought tremendous changes in the society which is seen

978-1-5386-7966-1/18/$31.00 ©2018 IEEE

reflected in libraries too. Technology dominated almost all areas of library services, like acquisition, technical works in the library, processing and dissemination. Web sites of Amazon, Flipkart etc are used for accessing documents; Online databases for E- journals; CD/DVD resources for instant search and the like. Online services have revolutionized the working of the library, and library professionals too have to adapt themselves, to the new environment, by acquiring new skills and competencies, to equip themselves to survive in the digital environment. In addition to the printed materials the University libraries are equipped with the online databases and journals.

II. REVIEW OF RELATED STUDIES

The review shows that a number of studies have already been done in the area, and the results reveals that most of the Organizations have recognized the value of KM in raising the status of the organization and thereby leading the nation towards progress.

Those improvements in technology are re-engineering the global industry in the present age of electronic information. Hence the author finds that, in the present scenario, library professionals and the libraries need to change and redesign their services in order to survive in the society [18]. That non-profit organizations need to incorporate KM into their regular operations. To make this process a success, organizations need to implement a reward system which can be a motivation to share knowledge and improve cooperation among groups. With limited resources, nonprofit organizations find it difficult to share knowledge with other professionals within or across the industry. Opportunities must be provided to share knowledge and development of communities of practice [19].

ICT infrastructure can meet the challenges of the dynamic world [22]. That mere technology is not enough to provide quality services. It is necessary to appoint skilled professionals and also to give proper training to the staff to meet the demands [25]. The present day libraries are well equipped with new technologies and provide technology based services. He finds that IT enabled services satisfy the users [22].

In this research found that the use of IT in libraries will enhance operational efficiency of libraries, and thereby satisfy the ever increasing need of users. Information professionals must change their role as knowledge professionals. Librarians must acquire new skills to keep themselves updated to cope with effective knowledge management [25]. States that Computer and related technologies have brought revolutionary changes in the world of information [28].

III. METHODOLOGY

In the study survey methods was used for data collection. A widespread literature was reviewed from different search engines, websites, electronic resources and blogs. Questionnaire was developed from reviewed literature for data collection from respondents. Questionnaire was distributed by Email or Google form. Questions regarding ICT tools used for knowledge management, problems to use ICT tools for KM and benefits of ICT with KM,

The article is part of the study conducted to analyze the 'Application of KM techniques in University Libraries in Pakistan'. It was found that ICT and its tools are used to manage resources in the process of KM. The total population of the study includes the library professionals, faculty, students and research scholars of Universities of Pakistan. Convenience sampling technique was used to collect data. The primary data was collected from selected University Libraries using questionnaire and interview methods and for data analysis SPSS 20.0 version was used.

IV. Data Analysis and Discussion

A. Use of ICT in Enhancing KM in Libraries

The University Libraries strongly support research activities and hence it is the place where new knowledge accumulates in large numbers. The Universities in Pakistan possess digital collections of Thesis/Dissertations, Books etc. Libraries are going digital. In such an environment, most of the libraries have started automation. University libraries also are not an exception.

Table 1: Mode of Accessing Resources

Mention the mode of access of these resources	Frequency	Percent
Inside the campus via intranet	77	52.0
Through IP authenticated Access	100	67.6
From Central library	99	66.9
From Website	29	19.6
Using user ID and Password	20	13.5

Internet and Intranet facilities have provided easy access to electronic resources. It can be found from the above table that 67.6% of the respondents provide access to the resources in the library through IP authenticated access; 66.9% from the Central Library; 52% inside the campus via intranet; 19.6% of them provide access from website; 13.5% are providing user ID and password to access these resources. Intranet facility enhances centralized access of resources.

Table 2: Services provide with the Help of ICT

Does your library provide the following services using ICT	Frequency	Percent
Multimedia service	79	53.4
Internet facilities	133	89.9
CA	63	42.6
SDI	45	30.4
OPAC facilities	139	93.9
Web OPAC	89	60.1
Digital Library facilities	115	77.7
Library Website	94	63.5
Electronic document delivery	71	48.0

With the advent of Technology, libraries started providing services using ICT. The table clearly shows that majority of the libraries provide OPAC facilities and Internet facilities to the users. 93.9% of the ULs in Pakistan are providing OPAC facilities to their users; 89.9% give Internet facilities to its users; and 77.7% provide digital library facilities.CAS, SDI, multimedia facilities, electronic document delivery services etc are also provided by the University Libraries. Hence it is clear that technology is being used in UL.

Table 3: Participation with National Library Network

Is your Library participating in any National Library Network	Frequency	Percent
Pakistan Library Association	137	92.6
Pakistan Library Club	72	48.6
Others	6	4.1

National Library networks helps to satisfy the information needs of the users. It provides catalog service; database Services; document supply services; e-mail services etc. It is evident from the above table that majorities (92%) of the University Libraries in Pakistan are participating in Pakistan Library Association; 48.6% are members of Pakistan Library Club; 4.1% are having membership in other National/ International Library Networks.

Table 4: Mode of Accessibility of E-Resources

Mode of accessibility of E-resources	Frequency	Percent
Campus wide access through IP authentication	121	81.8
User ID/ Password	27	18.2
Through Library only	31	20.9

There are different modes of accessing E-resources. The table shows that 81.8% University Libraries in Pakistan are accessing E-resources Campus wide through IP authentication; 20.9% are using Library only to access them; and 18.2%access it through user ID/Password. The above table shows that the University Libraries are using technology to access E-resources.

Table 5: Effectiveness of Services

How do you know the effectiveness of your services	Frequency	Percent
Directly ask users	78	52.7
Through Close observation	77	52.0
By conducting user study	52	35.1
Record queries of users	68	45.9
Maintain suggestion box	80	54.1

Mere implementation of technology is not enough. Assessment must be made to know its effectiveness to users. Different libraries use different methods to understand the effectiveness of the services provided by them. The above table shows that 54.1% of the University Libraries in Pakistan maintain suggestion box; and 52.7% of the Libraries directly ask the users. 52% of them gather information regarding the effectiveness of services through close observation; 45.9% of them record the queries of users and 35.1% conduct user study. It is clear from the above table that majority of the University Libraries maintain suggestion box to find out the effectiveness of their services.

Table 6: Problems using ICT for KM

Problems faced by you in using Information Communication Technology for managing Knowledge	Frequency	Percent
Lack of training	113	76.4
Lack of time to learn	54	36.5
Fear of ICT applications	39	26.4
Technical problems	125	84.5
Lack of communication skills	75	50.7
Lack of co-operation from other Staff	43	29.1

Information Communication Technology is used to manage knowledge in Libraries. Technology, when applied will face

problems, in the initial stages of implementation. It is clear from the above table that 84.5% of the librarians are of the opinion that Technical problems are the major problem faced by them in using ICT for managing knowledge; 76.4% admit that lack of training is the major problem; 50.7%agree that lack of communication skills is the major problem; 36.5% says that lack of time to learn is the main problem. 29.1% are of the opinion that lack of co-operation from other staff is the problem faced by them in using ICT for managing knowledge. 26.4% agree that fear of ICT applications is the major problem.

It is evident from the table that 'Technical problems and lack of training' are the major problems faced by the librarians in using ICT for managing knowledge.

Table 7: Web Tools Used for KM

How often you use the following web tools	Daily	Once in a week	Twice in a week	Never
Blogging	17(11.5)	24(16.2)	14(9.5)	94(62.8)
Facebook	94(63.5)	13(8.8)	20(13.5)	21(14.2)
Audio/videosharing/web casting	16(10.8)	18(12.2)	17(11.5)	99(65.5)
Email/chat/skype	125(84.5)	10(6.8)	7(4.7)	6(4.1)
Discussion groups	49(33.1)	12(8.1)	9(6.1)	78(52.7)
Twitter	15(10.1)	33(22.3)	5(3.4)	95(64.2)
You Tube	55(37.2)	29(19.6)	18(12.2)	46(31.1)

ICT has introduced modern tools to share information. Social networking sites promote sharing of information to a large extent. It is clear from the above table that majority of the respondents are using web tools like Email and Facebook for sharing information. ICT is used to share knowledge also.ICT has introduced several softwares to manage the collections in the library. The study also indicates that majority of the respondents are familiar with the Library Management Software KOHA. The professionals are also familiar with Dspace, CDS/ISIS, SOUL, LIBSYS, GREENSTONE, Granthalaya etc.

Table 8: Use of Technologies to Share Information

Do you use the following technologies to share information /knowledge	Frequency	Percent
Blogging	70	47.3
Email	140	94.6
Discussion Groups	65	43.9
Social networking tools	106	71.6

It is clear from the above table that majority of the respondents are using email (ICT Tool) for sharing information.

One of the objectives of the study is to find out the level of enhancement of KM using ICT in University Libraries of Pakistan. For collecting the required data, the respondents are asked a set of 11 questions in the five point Likert scale regarding the usefulness of ICT in enhancement of KM. The responses are scored as 1 for 'Strongly Disagree", 2 for 'Disagree', 3 for 'Neutral', 4 for 'agree' and 5 for 'Strongly agree'.

The total score, of the questions for all 145 respondents, is found out, based on which we calculate the mean % score

◆ - ——————— of the usefulness of ICT in enhancement of KM for each of the respondent. A one sample Z test is carried out to test the significance. The following table gives the Mean, Standard Deviation (SD), Mean % Score and Z value of the variables considered. [29].

The regression coefficients of Usefulness of ICT are given below.

In this case the constructs has regression coefficient value more than 0.4. That is, in this case, all these constructs has significant impact on usefulness of ICT in managing information/knowledge in Libraries.

Before doing further analysis, all the constructs which has no impact on the variables are removed. That is the analysis is carried out only with the construct having significant impact on the variables considered.

Table 9: Regression Coefficients Usefulness of ICT

Factors/ Latent Variables (Dependent Variable)	Construct (Independent Variable)	Regression Coefficient	C.R.	P	Variance Explained (%)
Usefulness of ICT	U1	0.659			43.5
	U2	0.622	6.722	<0.001	38.7
	U3	0.530	5.761	<0.001	28.1
	U4	0.725	7.33	<0.001	52.5
	U5	0.721	7.345	<0.001	51.9
	U6	0.622	5.698	<0.001	38.7
	U7	0.753	7.704	<0.001	56.7
	U8	0.532	5.815	<0.001	28.3
	U9	0.645	6.25	<0.001	41.5
	U10	0.601	6.291	<0.001	36.2
	U11	0.532	5.728	<0.001	28.4

Table: 10 Mean, SD and Z value for the Usefulness of ICT in Enhancement of KM

Variable	N	Mean	Std. Deviation	Mean % score	CV	z	p value
The usefulness of ICT in enhancement of KM	148	42.01	6.64	76.39	15.81	1.399	0.164

The mean percentage score of the usefulness of ICT in enhancement of KM is 76.39% which indicate that the usefulness of ICT in enhancement of KM is excellent. The $CV = \frac{\text{Standard deviation}*100}{\text{Mean}}$ indicate that this score is stable as the value is less than 20%. To test whether the sample information that we observe exists in the population or to verify that the usefulness of ICT in enhancement of KM is good or excellent, we formulate the hypothesis

H_0: The usefulness of ICT in enhancement of KM in university libraries of Pakistan is excellent.

H_1: The usefulness of ICT in enhancement of KM in university libraries of Pakistan is good.

To test the above hypothesis we use one sample Z test and the result is exhibited in Table 17. From the table the p value is 0.164. So we conclude that the usefulness of ICT in enhancement of KM in University Libraries in Pakistan is excellent.

V. MAJOR FINDINGS OF THE STUDY

The significant findings of the study are as follows:

1. Books form the major source of information in the University Libraries in Pakistan.
2. Libraries collect information in multiple formats.
3. Along with printed materials, the University Libraries maintain digital collections also.
4. The University Libraries are providing Intranet facilities and IP authenticated access for exploring remote information sources.
5. The University Libraries in Pakistan are very serious about automating the library.
6. Internet, OPAC, multi media facility, digital library facility, document delivery services etc are provided by the University libraries in Pakistan.
7. The University libraries are participating in National library Networks.
8. To understand the effectiveness of their services, majority of the University Libraries maintain suggestion box.
9. Technical problems and the lack of training are the major problems faced by professionals in using ICT for KM in libraries.
10. Social networking tools and E-mail services are being used by professionals to share information.
11. Most of the library professionals are familiar with Library Management softwares.
12. Most of the library professionals are good at sharing information and are sharing information using ICT tools.
13. The usefulness of ICT in enhancement of KM in University Libraries in Pakistan is excellent.

VI. SUGGESTIONS AND RECOMMEDATIONS

Based on the analysis of data and findings, the followings suggestions and recommendations are listed as follows:

1. Library being an organization with limited funding, care may be taken to collect and manage its resources so that maximum number of users may get the benefit.
2. Regular training programs or similar activities on the usage of Information Communication Technologies may be given to the library professionals to increase their efficiency.
3. Encouragement should be given to library professionals to attend workshops, seminars to update their knowledge.
4. Presence of proper ICT equipments in the library system can be useful in exploiting the resources in a better way.
5. Measures may be taken to encourage library professionals to acquire new skills and competencies to survive in the technological environment.
6. Information sharing culture should be entertained among the library professionals.
7. A user study will help to know effectiveness of the newly introduced technologies.

VII. CONCLUSION

The results of the study show that most of the University Libraries in Pakistan have clear understanding of the impact of the new technologies and are seriously moving towards automation to exploit the benefits of ICT and to increase the efficiency of services. The library professionals are interested in acquiring new skills and also to provide technology based services to manage knowledge. The study shows that the library professionals are aware of the benefits of technologies and are actively participating in National library Networks, and other similar fields. They are aware that lack of training and technological limitations is hindering their growth towards advancement. Library professionals in the Universities of Pakistan have positive inclination towards use of ICT and knowledge Management. The study is limited to only five reputed Universities in Pakistan and hence it is difficult to generalize the impact of the findings.

REFERENCES

[1] Archana Shukla, "Assessing University Libraries in Uttar Pradesh with Emphasis to Infrastructure and Information and Communication Technology Applications", *DJLIT*, vol. 35, No. 4, pp. 266-272, 2015.

[2] E. Ziemba, M. Eisenbardt and R. Mullins, "Information and communication technologies for supporting prosumers knowledge sharing - evidence from Poland and United Kingdom," *2016 Federated Conference on Computer Science and Information Systems (FedCSIS)*, Gdansk, 2016, pp. 1273-1282.

[3] S. Cleveland, L. Mitkova and L. C. Gonçalves, "Knowledge flow in the open innovation model the effects of ICT capacities and open innovation practices on knowledge streams," *SoutheastCon 2015*, Fort Lauderdale, FL, 2015, pp. 1-2.

[3] Sveiby, K., "*The New Organisational Wealth*", San Francisco: Berrett-Koehler, 1997.

[4] Davenport, T., & Prusak, L., *Working knowledge: How Organisations Manage What They Know. Boston",* Massachusetts: Harvard Business School Press, 1998.

[5] Taylor. R.M., "Steps on the Path of Knowledge. In Milne, P. (2000). Information professionals and the knowledge aware, intelligent organization". *Australian Library Journal* vol. 49, No. 2, pp. 139-151, 1999.

[7] Rajan, A; Lank, E and Chapple, K, "*Good practices in knowledge creation and exchange Tunbridge Wells"*, UK: CREATE, 1999.

[8] Dyer, G., "KM Crosses the Chasm - IDC state of the Market Survey", *Knowledge Management*, vol. 3, No.3, 2000.

[9] Bertrot, J.C., McClure, C.R., Davis, D.M. and Ryan, J. "Capture usage with e-metrics", *Library Journal*, available at: *ww.libraryjournal.com/article/CA411564Pdisplay = Features News & industry,* 2004.

[10] Choy, C. S., & Suk, C. Y., "Critical factors in the Successful Implementation of Knowledge Management", *Journal of Knowledge Management Practice ,* pp. 132-137, 2005.

[11] Islam, S, &Islam, M.N., "Information and Communication Technologies (ICT) in Libraries : A New Dimension in Librarianship", *Asian Journal of Information Technology,* vol. 5, No. 8, pp. 809-817, 2006.

[12] Koohang, A., Harman, K., & Britz, J. (Eds.)., "Knowledge Management: Theoretical Foundations", Informing Science, Vol. 1, 2008.

[13] Okore, A. M., & Ekere, J. N., "Information Professionals and Knowledge Management in Global Library and Information Services". Libraries without Borders: 2008 *Globalisation of Library and Information Services*, vol. 53.

[14] Raja, W., Ahmad, Z., & Sinha, A. K., "Knowledge Management and Academic Libraries in IT Era: Problems and positions". In Poster paper at international conference on academic libraries at University of Delhi, Vol.8, 2009

[15] Okiy, Rose B., "Globalization and ICT in Academic Libraries in Nigeria: The Way Forward", *Library Philosophy and Practice (ejournal). Pape*r 501, 2010.

[16] Kamba,Manir Abdullahi, "Implication of ICT's in Libraries of Higher Education Institutes:A Panacea Catapulting Library Development in Africa", *DESIDOC Journal of Library & Information Technology,* 2011.

[17] Vijayakumar, A& Sudhi s Vijayan, "Application of Information technology in libraries : an over view", *International Journal of Digital library services*, vol. 1, No. 2, pp. 144-152, 2011.

[18] Prakash, V., "*Inclusive and Qualitative Expansion of higher education", 12th Five Year Plan 2012-17*. New Delhi: University Grants Commission, 2012.

[19] Kumar Agarwal, N., & Anwarul Islam, M., "Knowledge Management Implementation in a Library: mapping tools and technologies to phases of the KM cycle*", VINE*, vol. 44, No. 3, pp. 322-344, 2014.

[20] Sharma, S B., "Library Resources and Services in ICT Environment*", Universtiy News*, vol. 53, No. 11, March 16-22,2015, pp. 15-17, 2015.

[21] Gurikar, Rushmansab & Mukherjee, Bhaskar, "Information Technology Usage Scenario in Academic Libraries of Higher Education in Chhattisgarh: Challenges and Opportunities", *DESIDOC Journal of Library & Information Technology*, vol. 35 , No. 4, pp. 273-280, 2015.

[22] Kaptan, S & Kore, A S, "Role of Universities in Make in India", *University News,* vol. 55, No. 04, pp. 23-29, 2017.

[23] W. Sun, Q. Ma, T. Gao, H. Wang and L. Guo, "Applications of Semantic Web Technologies for Ontology-Based Knowledge Management in Product Development," *2008 4th International Conference on Wireless Communications, Networking and Mobile Computing*, Dalian, 2008, pp. 1-4.